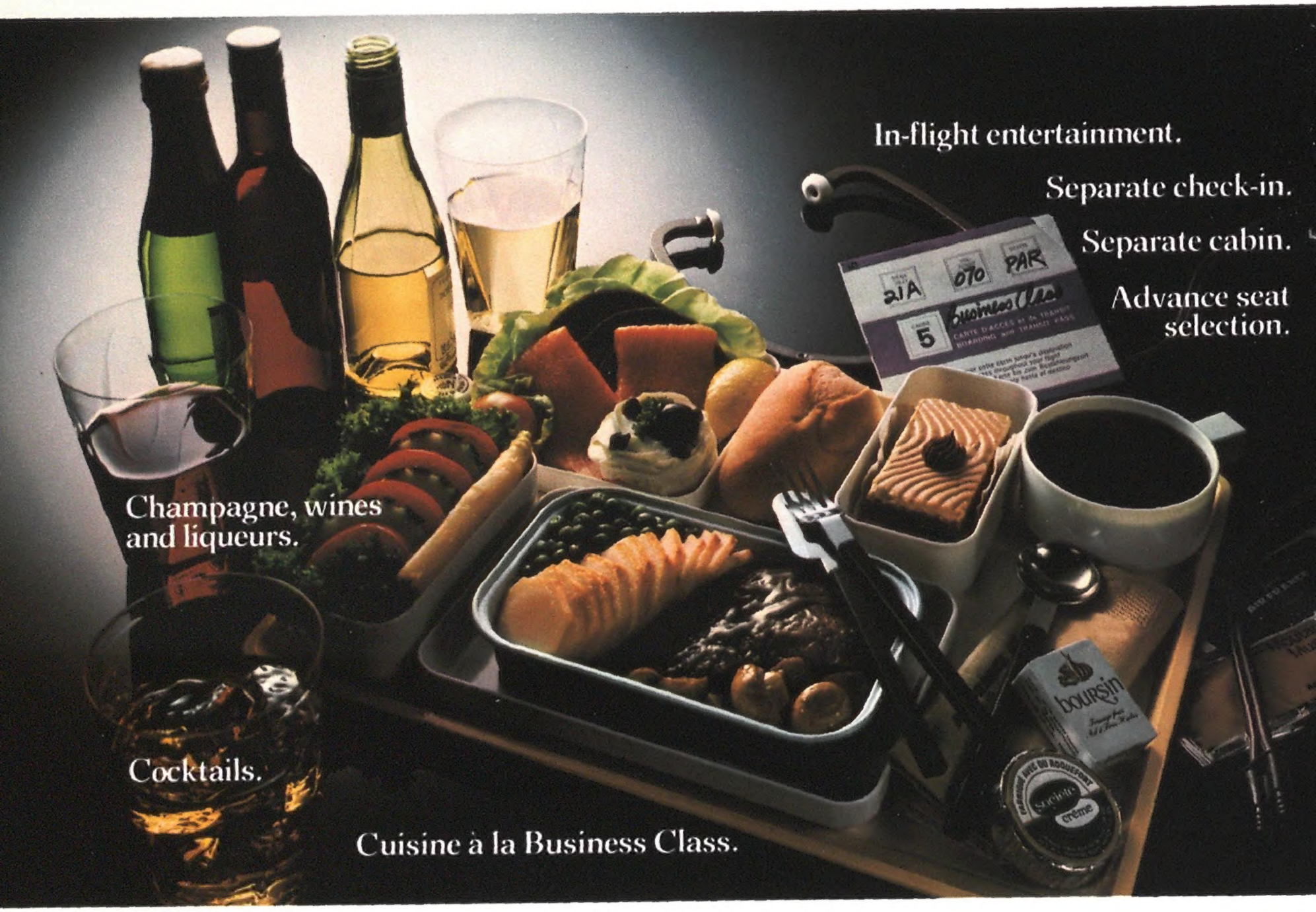
June 1980

# Smithsonian

Swinging from his aerial 'web'
a rain forest biologist probes
an unknown canopy world (p. 42)

# La Différence.

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Throughout the history of the automobile industry, product change was almost always evolutionary. But in 1973, GM determined that the times required revolutionary changes. It started its first Project Center—which by itself heralded a revolution in the use of science and technology to meet the changing demands of the marketplace. A few months later, the Arab countries launched the oil embargo. Fortunately, machinery was already in motion in GM to create and develop new cars and components in a new way and faster than ever before.

**GM's first Project Center brought out totally new full-size cars:** smaller, yet roomier, and far more efficient than their predecessors. The advertisements said they were "designed and engineered for a changing world"—and they were. Another Project Center, begun in 1975, developed the immensely popular GM X-cars.

Led by the five car divisions, Project Centers gather people, ideas, and knowledge from all 30 divisions and staffs of General Motors. In the first stage, which we call "concepting," experimental engineers, environmental scientists, forward planners, and marketing experts pool their thinking. Their objective: what the marketplace will require. This is the most important stage. Here we must determine not only what kind of car, but how many we might be able to build and sell years later. Economics, customer tastes, availability of various kinds of fuels must be compared with state-of-the-art technology—and what steps must be taken to advance that technology quickly yet surely.

In the "concepting" stage, a new car is conceived. If the car is to be sold to customers three years later, construction of new plants must begin and basic tooling must be ordered.

The second phase of the Project Center takes 24 to 30 months. It encompasses development, design, structural analysis, handling analysis, emissions, noise and vibration, safety, reliability, serviceability and repairability, manufacturing, assembly, marketing, financing.

Advanced product engineers and research scientists work with the one hundred fifty to two hundred people at the Project Center and thousands more in the staffs and divisions to transfer new science and technology to the new car. Components are hand-built and "cobbled" into existing models for road testing.

**Prototype cars are hand-built at a cost of more than $250,000 each.** These enable the Project Center team to determine how newly developed, pretested components operate as a unit. Then, pilot models will be built from production tooling and tested some more. New technology, such as structural analysis by computer, saves time. Lead time has been reduced by 25% from ten years ago, when cars were far less complex.

After almost four million miles, nearly three billion dollars, and nearly three years of work, the new cars—quite unlike anything before them—start coming off the production line at a rate of better than one a minute.

**There are now eight Project Centers in General Motors.** Four are developing new cars using hydrocarbon fuels, one is creating an electric car, and others are working on computerized engines and emission controls, a new kind of automatic transmission, and the inflatable restraint system.

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*Smithsonian* (ISSN 0037-7333) is published monthly by the Smithsonian Associates, 900 Jefferson Drive, Washington, D.C. 20560.
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Subscription price $14 a year in U.S. and possessions, $17.50 elsewhere.
Single copy price $1.25.
Second-class postage paid at Washington, D.C.
Editorial offices, 900 Jefferson Drive, Washington, D.C. 20560.
Advertising and circulation offices at 420 Lexington Ave., New York, New York 10017.
Please address all subscription correspondence and change of address information to P.O. Box 2955, Boulder, Colo. 80322

*June 1980*

# Smithsonian

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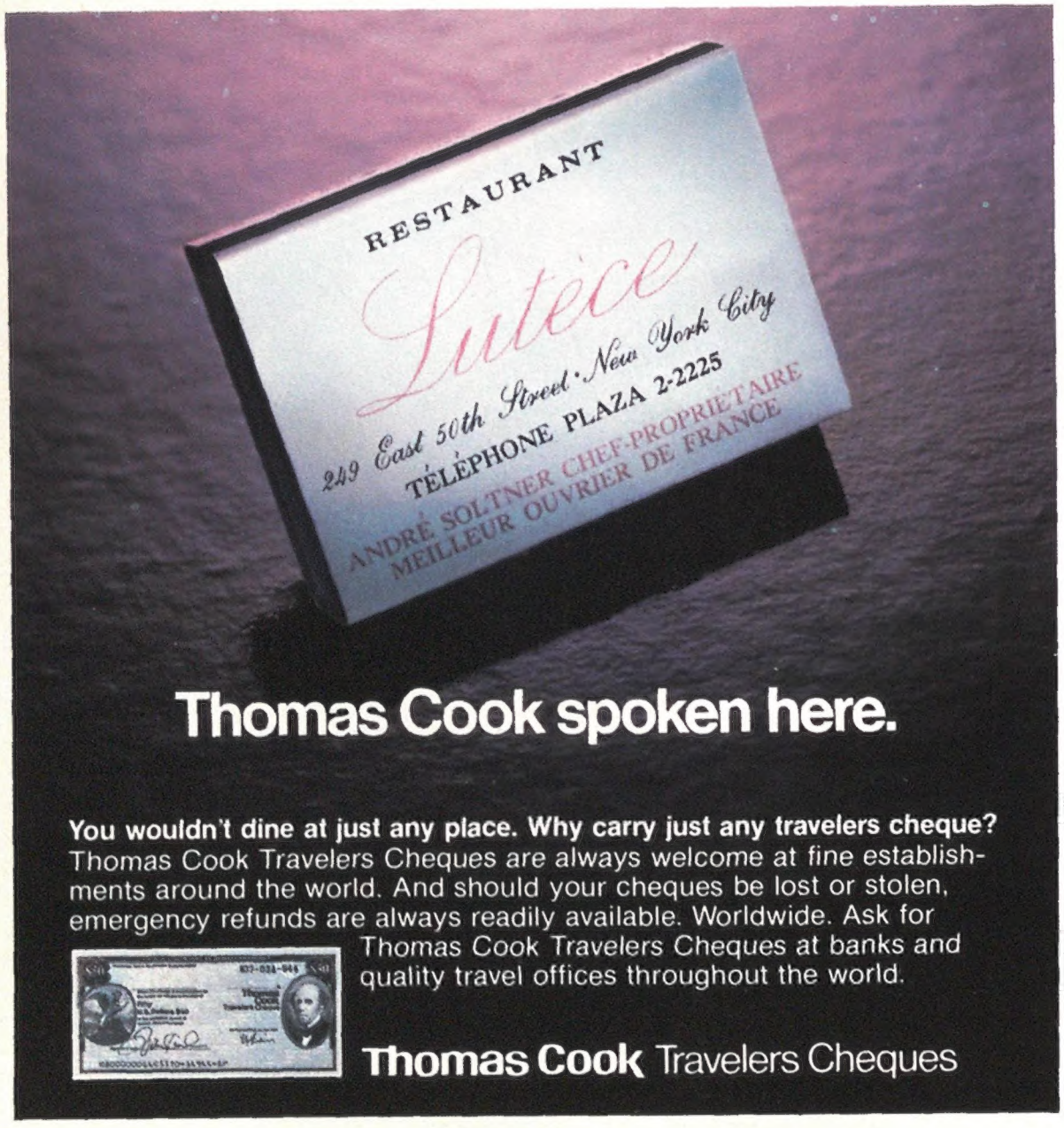


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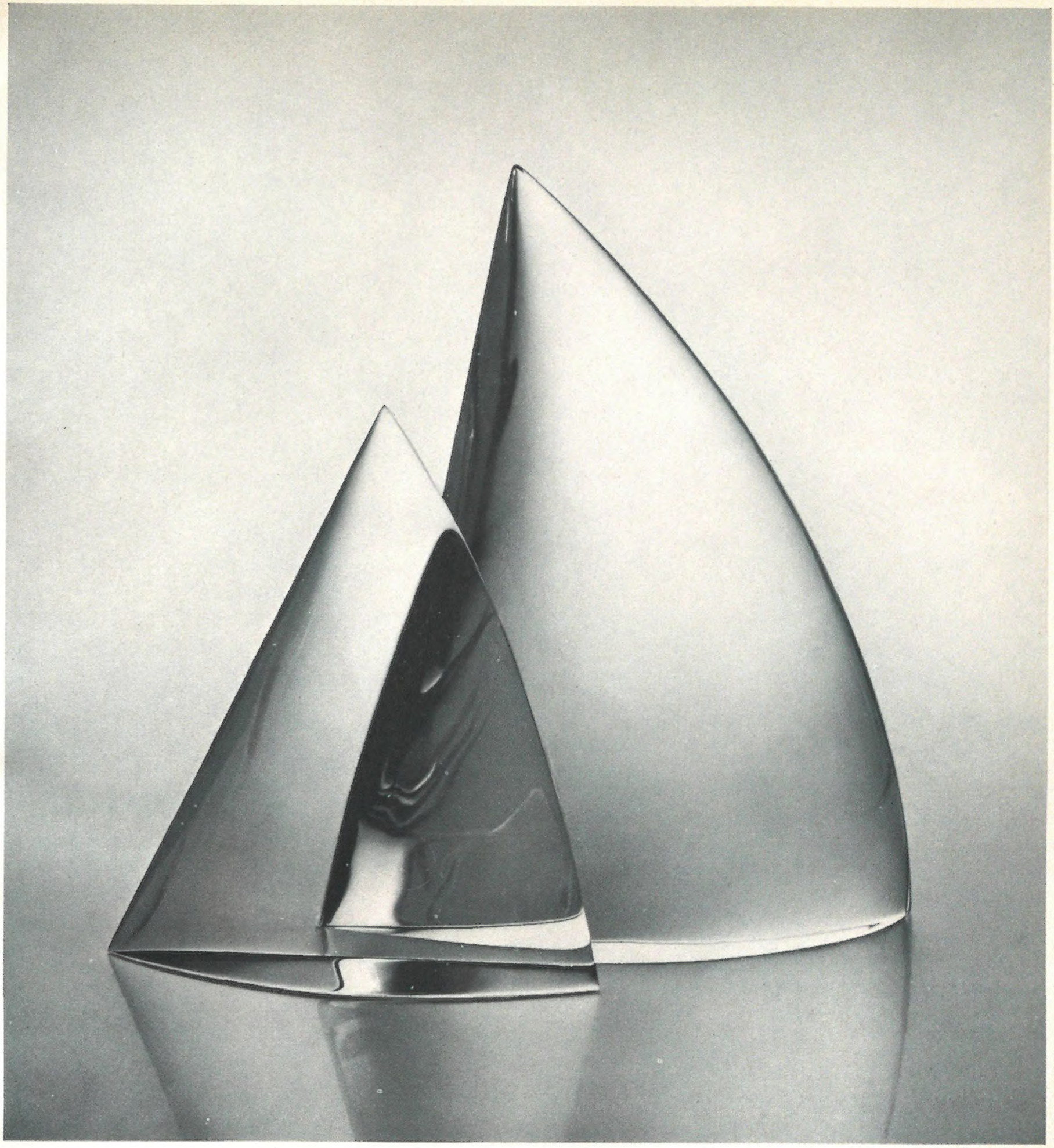

Close to the Wind: A two-part, solid crystal sculpture depicting the full, curved surfaces and taut edges that are the essence of sailing. Light captured within the crystal suggests the changing effects of light upon sails and water. Designed by Lloyd Atkins. Height, 8". $2,950.
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Steuben is part of Corning Glass Works and has been since 1918.

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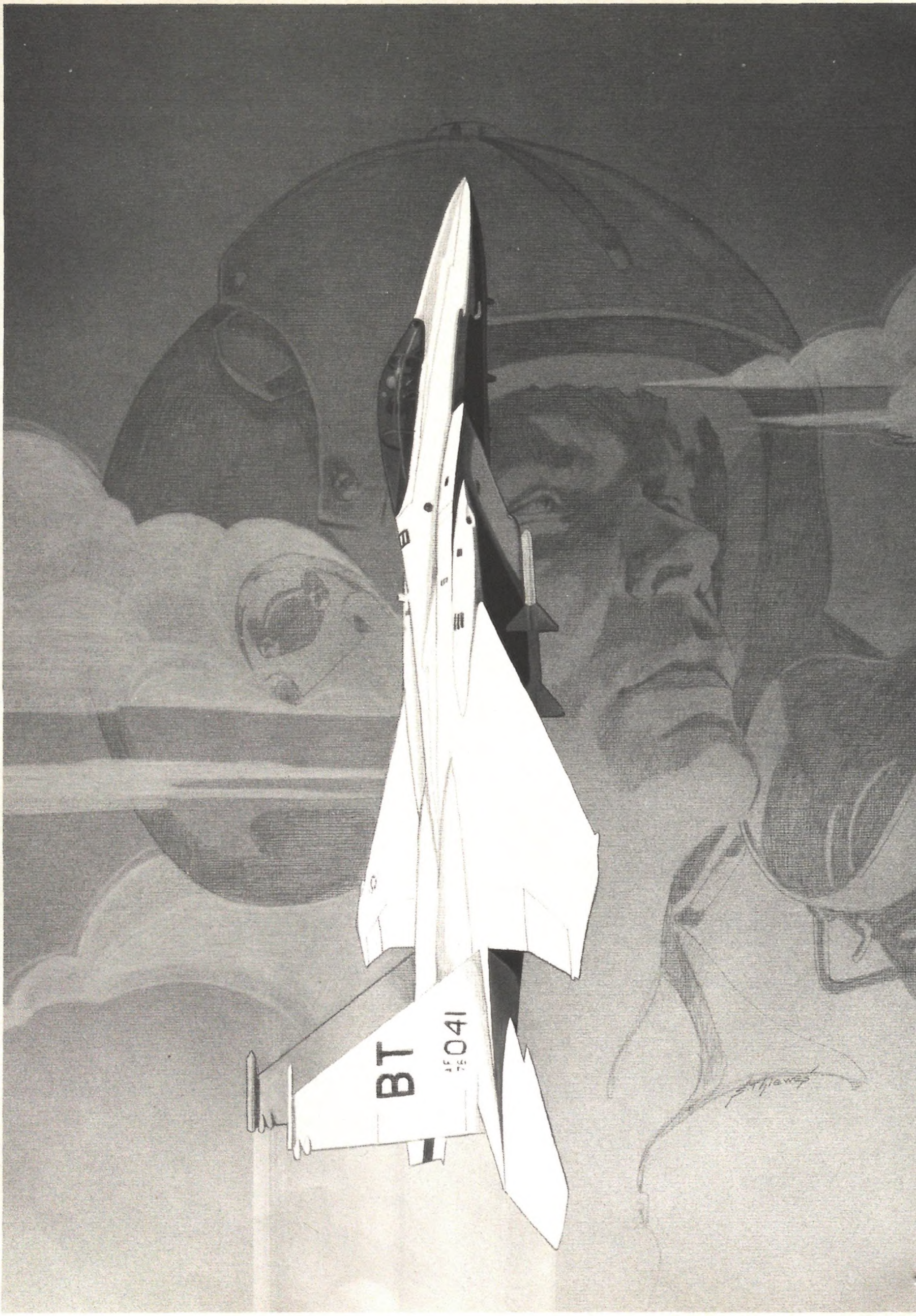
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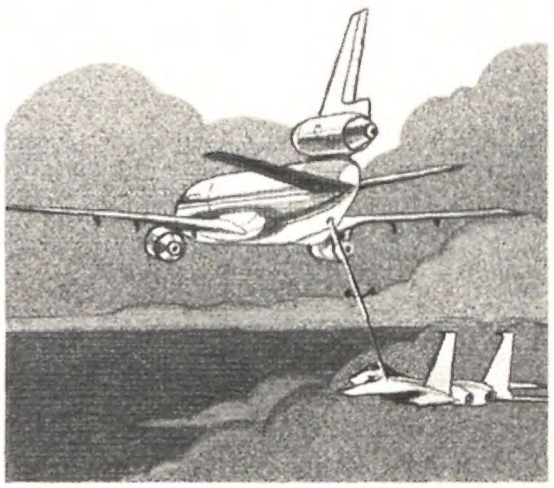
For defending the skies, no plane can match its combination of range, armament, speed and maneuverability. For combat, the Eagle's advanced electronic systems, long range radar, and mix of missiles, bombloads and gun give Eagle pilots the advantage over any threat they may face. Whatever the need, whatever the mission, McDonnell Douglas has the ideas, and the planes, to do the job.

**Refueling and airlift all in one plane.**

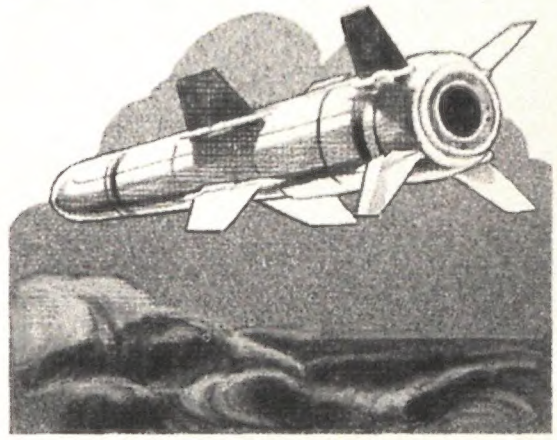
A version of our DC-10 jetliner, the KC-10, has been selected by the U.S. Air Force for tanker and cargo missions. The KC-10 can refuel fighters or other cargo planes far out over the Atlantic



and then fly home. Or it can carry up to 85 tons of cargo to bases in distant lands. With the KC-10, the U.S. will be able to send planes and their support crews and equipment just about anywhere on earth, whenever and wherever they are needed for Free World defense.

**Keeping the sea lanes free lanes.**

We're building the Harpoon sea defense missile so that it can be launched from submarines, ships, or aircraft. A single ship equipped with Harpoons can continuously defend 8,000 square miles (20,000 square kilometers) of ocean. Day or night, in any weather or sea condition, Harpoon now stands guard with the U.S. Navy and with several Allied nations.



Harpoon—one missile for many services but with one mission—to keep the sea lanes free.

*If you would like more information about our products for defense, and about what we do in energy, health care, air transport and communications, send for our colorful and informative folder. Write "What We Do," McDonnell Douglas, Box 14526, St. Louis, MO 63178.*

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*Secretary Ripley's comments*

# *The view from the castle*

*Though weary of politics at home and crises abroad, we should use July to remember national goals and jack up our faltering will*

Summers should be joyous in this land of ours, especially in July when we celebrate the anniversary of our independence on July 4. But instead this seems to be the "summer of our discontent." It is odd to think that we, who started out 200 years ago so full of a desire for change, of a weariness with the old ways—heavy taxation by the Motherland, submission to colonial rule with a sense of oppression—now feel a sense of weariness with the *new* ways. We have become gun-shy about the rest of the world, feeling that our motives are misunderstood, that all the good works we have done have stood us in poor stead. No one abroad seems to like us very much.

Here at home, too, no one is very popular. We are in the throes of a quadrennial ritual, which with its news coverage to the point of saturation, polls and kindred pulse taking, has truly turned us into a nation of hypochondriacs. We pack metaphorical thermometers and portable blood-pressure kits into our handbags and briefcases. Every day some new index of the relative popularity or standing of one of the political candidates is dredged up, as if we could not do without this high-cholesterol media diet. How stale it all seems—the temporary panaceas, the unexamined issues, the jaded slogans.

It is a paradox that this Presidential campaign, stretched out almost beyond endurance by the system of endless primaries, seems to have evoked, by its very repetitiveness, a vast passivity. The public pulse so far remains subliminal—unstirred, perhaps deadened by the variety of drumbeats and rhetoric. Government does not seem subject to control by those who would control it. Hostility, terrorism and desperate tactics are in the ascendant, springing up like mushrooms everywhere. Anarchic thoughts are abroad in the land, and our imagination is subdued and is seemingly in decline.

But we should remember that election times have been difficult before, and that our history reaffirms a stable and persistent will. I am reminded of an election poem (anonymous) of 1800:

> The gloomy night before us flies;
> The Reign of Terror now is o'er;
> Its gags, inquisitors and spies,
> Its herds of harpies are no more.
> Rejoice, Columbia's sons, rejoice,
> To tyrants never bend the knee,
> But join with heart and soul and voice,
> For Jefferson and Liberty!

It is within our power to revive our faltering will. We have been down this path before. Our national resources of mind and kind are plain for all to see. We should merely rejoice in being ourselves, faithful to the nation that gave us birth. We are a nation dedicated to peace and a new view of civilization. We are still as determined to achieve our national goals as we ever were.

July, then, should serve as a time to remind ourselves that the pursuit of peace is a weapon and not a broken reed. Our cause is just and we have the means to achieve it. Let us reaffirm it next month in the full light of our own history with confidence and with reinvigorated will.

S. Dillon Ripley

# FORD'S EXCLUSIVE CLUB ROOM

**1980 Ford Captain's Club Wagon. Best EPA gas mileage rating of any van. Station wagon luxury—much more room.**

Here's one exclusive Club everyone can easily enter! Ford's advanced Club design means more move-around room for driver and plenty of inside passenger comfort. Built tough: Separate body-on-frame construction, rugged Twin-I-Beam suspension. See your Ford Dealer. And ask about Ford's Extended Service Plan.

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**Super wagon size, too!** Ford wagons offer seating plans for four to 15 passengers. And Ford Club Wagons offer light- and heavy-duty Trailer Towing Package options.

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# *Letters to the Editor*

## *Chinese bronzes*

Dear Sir: Having just seen the Chinese Bronze Age exhibition at the Metropolitan Museum of Art, described in your April issue, we want to congratulate SMITHSONIAN on your fascinating article and, in addition, the one you published in November 1979 on recent archaeological finds. With such information as background we can readily say that the exhibit came to life and had meaning that otherwise would have been missing.
*Alan C. Benjamin*
Stamford, Connecticut

Dear Sir: I very much enjoyed your article on the bronzes of old China, or should I spell it Qina? To be perfectly consistent with your new (old) spelling, the second is correct. In your November article on the vast soldiers' tomb with the life-size figures, there seemed to be a plot going forward to spell everything in some crazy polyglot way in order to make the East even more mysterious. I presume we should use Qina from now on, pronouncing the "Q" "Ch," but it doesn't help my understanding of the Orient.

I am a sculptor and cast a bit of bronze. I wish I could do it with the majesty of the Chinese (Qinese).
*Cabot Lyford*
Exeter, New Hampshire

## *Kalahari Bushmen*

Dear Sir: In Elizabeth Marshall Thomas' article about her family's long friendship with the Kung Bushmen of the Kalahari, she describes how the Marshall's Bushmen guides amused themselves by imitating the sounds of English "with perfect intonations—they spoke exactly like two Americans having a conversation."

I read this article while in the midst of Darwin's *The Voyage of the Beagle* and felt a stab of recognition at Elizabeth Thomas' words. About the primitive natives of Tierra del Fuego, Darwin wrote: "They are excellent mimics: as often as we coughed or yawned, or made any odd motion, they immediately imitated us. . . . They could repeat with perfect correctness each word in any sentence we addressed to them. . . . All savages appear to possess, to an uncommon degree, this power of mimicry. . . . How can this faculty be explained? is it a consequence of the more practised habits of perception and keener senses, common to all men in a savage state . . . ?"

I found this a felicitous correlation of observations—more than a century apart.
*Nancy Bratman*
Los Altos, California

## *Animal rights*

Dear Sir: Thank you for David Nevin's article about Michael Fox and his fight for "animal rights." It made for disturbing reading, but at least I am enlightened and will not, through ignorance, continue to utilize products that are the result of inhumane practices.

Deliberate mistreatment has no justification, and no product should have as its goal such perfection that it must be produced through suffering.

There is much human and animal misfortune in our world that is unavoidable, so any positive steps that can be taken to eliminate whatever can be avoided should be implemented without delay.
*D. L. Burton*
Fort Worth

Dear Sir: Before reading this article, I felt sure that by this day and age Man had discovered a humane way of slaughtering animals. Much to my sorrow and dismay, it is apparent he has not. There must be a widely held belief among those farmers and laboratory scientists that animals feel no pain. How they sleep at night after performing these atrocities on defenseless animals is beyond me. If there is such a thing as reincarnation, may every one of them come back as animals!
*Kay Heile*
Richmond, Virginia

Dear Sir: Your account of the treatment rendered the animals by those in search of the almighty buck has kept me awake. Never again will I eat veal; never again will chicken be special in my home.
*Hugh King*
Signal Hill, California

Dear Sir: I realize that everything serves a purpose, and I know that eventually the animal winds up on the dinner table, but for goodness sake, please let the creature have some element of dignity while still alive!
*Brenda Dignazio*
Phoenixville, Pennsylvania

Dear Sir: The mistreatment of animals raised for food and laboratories is unconscionable in a civilized nation and, worse, unnecessary.
*Barrie T. Collins*
Bethany, Connecticut

Dear Sir: I note the phrase: "Sometimes so little can make such a difference." Can animal handlers be so callous as to refuse their charges that "so little?"
*Frances A. Velay*
Oklahoma City

Dear Sir: I have been a borderline vegetarian for some time, indulging only in fish and poultry occasionally. Being an advocate of health foods, I came to the conclusion that meat is not a must for health. I realize I cannot control all the destruction and abuse of animals, but I want to be a part of helping.
*Betty D. Gallas*
Las Vegas

Dear Sir: Plants are also being treated unfairly. With the current fashionable trend toward vegetarianism, more and more plants are being killed simply to provide food for people. Plants are every bit as alive as animals. Come on, animal rights advocates—broaden your umbrella!
*M. E. Minock*
Larsen, Wisconsin

Dear Sir: If Dr. Michael Fox is so strong on animal rights, why doesn't he take that chain off his wolf and turn it out to the wilds, or perhaps he has kept it penned up so long he is afraid that it can't make it on its own.
*John H. Mohr*, O.D.
Pearl, Mississippi

# Make a meal for summer.

Crisp, rich and juicy!
A summer splendor of great natural tastes—whole grain rye, aged golden cheddar, juicy slices of peach, plum and nectarine. Perfect for lunch in the park, a late evening supper or a quick meal anytime.

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Dear Sir: I have been raising veal calves in confinement for six years. I do not say all confinement barns are as excellent as mine, but then there is good and bad in everything. I think your article has done a great injustice to me and to the veal industry.

Any farmer will tell you that raising calves is next to impossible—it takes luck, skill and tender loving care, patience and good common sense. Calves raised in confinement are dusted for lice, given vitamins and closely guarded around the clock for scours and pneumonia. Calves are raised in stalls for health reasons, not for the texture of the meat.

Our calves have names, are loved and hugged and can touch their neighbors easily to lick and rub noses. Their milk diet is rich and filled with protein—how else would they gain so much in 16 weeks and have so low a death rate?
*Susan M. Wesa*
Jefferson, Wisconsin

Dear Sir: Michael Fox has some very impressive credentials, but he must have something more concrete to offer as a solution than "know who you eat."
*Shirleyan Novak*
Arnold, Maryland

Dear Sir: Should you know of any specific pending legislation that should be supported by my Congressman, I would be happy to be informed. I am interested in furthering Mr. Fox's crusade for more humane conditions for animals.
*L. Hewitt Carpenter*
Marion, Indiana
*There are now four bills before Congress (H.R. 282, 4479, 4805, 6847) directed toward minimizing the pain inflicted on live animals in research tests. Nothing new is pending on the safeguarding of live animals raised on farms.* Ed.

Dear Sir: We need more gadflies like Michael Fox, and Texas has a network of people who have banded together for that purpose. The Texas Humane Information Network, based in Dallas, provides current information on national and state legislation dealing with improving animal welfare to members who wish to contact their lawmakers. We hope to become an ever-stronger voice for those who are sensitive to the needs of the creatures around us.

In the meantime, I am finding that

Victorian charmer!

Identical to the antique original—elegantly embellished, English-made by famed Old Foley! Antique white glazed earthenware, strawberry-strewn, nostalgic for the table or the collector's shelf. Our own import from James Kent—7½" high, holds 1 quart, dishwasher-safe.
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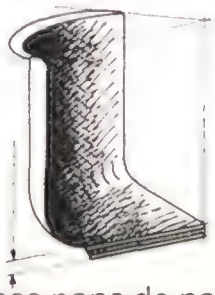
Everything from Steak Marchand de Vins to Spaghetti Primavera can taste considerably better when prepared in Cuisinart cookware. You'll turn out beautiful omelets in the same pan that cooks your steak faster and more evenly.

## THE FIRST REASON: ALUMINUM SURROUNDED BY STAINLESS STEEL.

Aluminum has exceptionally high heat storage capacity combined with high heat conductivity. This makes it a superior metal for use in cookware. But aluminum cookware without surface protection can change the taste of some foods and become pitted with use.



Some cookware manufacturers use anodized aluminum. These pans do not change the taste of any food, but they are not dishwasher proof, and will eventually warp and discolor. They cannot be used for food storage. Still other manufacturers fuse aluminum onto the bottom of their stainless steel pans. Although this improves evenness of heating, the bottoms of the pans change shape under heat—they do not stay flat at all temperatures. Cuisinart cookware surpasses all of these by having a thick disc of aluminum fused between *two* layers of stainless steel. The aluminum can't warp because there simply isn't any place for it to go. Our "sandwich" ensures a flat cooking surface at all temperatures, even if the cookware is dropped into cold water while hot.

## THE SECOND REASON: THE THICKNESS OF THE ALUMINUM INLAY.

Our thick aluminum inlay stores more heat and provides superior conduction of heat sideways as well as upwards. This eliminates hot spots and provides constant temperature over the cooking surface.

Heat storage is important. Each time you drop a cold piece of meat into the pan, the surface temperature immediately plunges. The meat can't brown until the temperature gets back up. The longer it takes to brown, the more the meat will be done inside. Because our aluminum inlay is unusually thick, it has much more heat storage capacity than other cookware. As a result, the initial temperature drop is less and the return to the proper temperature is much quicker.

## THE FINISHING TOUCHES.

One—the compressed wood handles stay cool on top of the stove and are unaffected by oven temperatures to 375°F. Rice pilafs, beef bourguignon and other casseroles can be started over a burner in a Dutch oven or stockpot, which then can go into the oven to finish cooking. This saves time, kitchen clutter and dishwashing.

Two—the rims won't dribble when you pour from them because they are dripless. Three—each cooking utensil is finished like a piece of jewelry. Every edge, every rim is polished and buffed.

## FOR MORE INFORMATION.

One of our favorite dishes is Steak Marchand de Vins. For the recipe and more information on our cookware, write Cuisinarts, Inc., 411 West Putnam Avenue, Greenwich, Conn. 06830.

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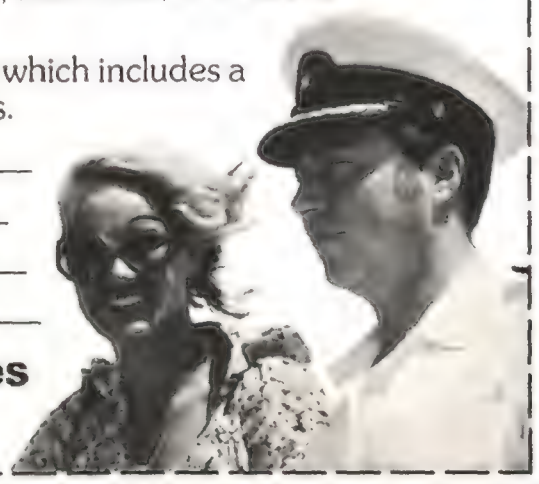


fruits and vegetables are more and more to my liking.
*L. Rickey*
Lindale, Texas

### *Lewis Thomas*

Dear Sir: In Timothy Ferris' interview with author-biologist Lewis Thomas, there is a stimulating paradox. Thomas challenges the human species to explore and understand while simultaneously forecasting no absolute resolution. How refreshing to encounter a concept that directs Man with two divergent themes: a basic biological organism hidden by complex psychological motivations.

Thomas doesn't allow human ignorance as an excuse. Nature's wonderment is offered as an inducement for Man to rethink science more for its questions and less for answers.
*Charles A. Vann*
Jacksonville, Florida

### *Relativity*

Dear Sir: The Einstein article by James S. Trefil, although quite abstruse, was very thought provoking. Michael Freeman's photographs were exquisite.

By a coincidence, I had just read a short story by George Ade, published in 1901 by Herbert S. Stone & Company. It was titled "*The* Fable *Of The* Preacher *Who* Flew *His* Kite, *But* Not Because *He* Wished *To* Do *So*." The analogy between this story and your Einstein was disturbingly apparent. There seems to be no defense against the incomprehensible.
*Henry R. Awad*
Bronx, New York

### *Miró*

Dear Sir: Your article about the retrospective exhibit of Joan Miró's art at the Hirshhorn was helpful to my family in understanding and appreciating his work. We collect art, in a small way, and have, on several occasions, come close to bidding on Miró prints at auctions. We hope to spend a weekend soon enjoying this exhibition and others at the Smithsonian.
*The Reverend Russell C. Block*
Berkeley Heights, New Jersey

### *Nation's Attic*

Dear Sir: The Smithsonian's exhibition,

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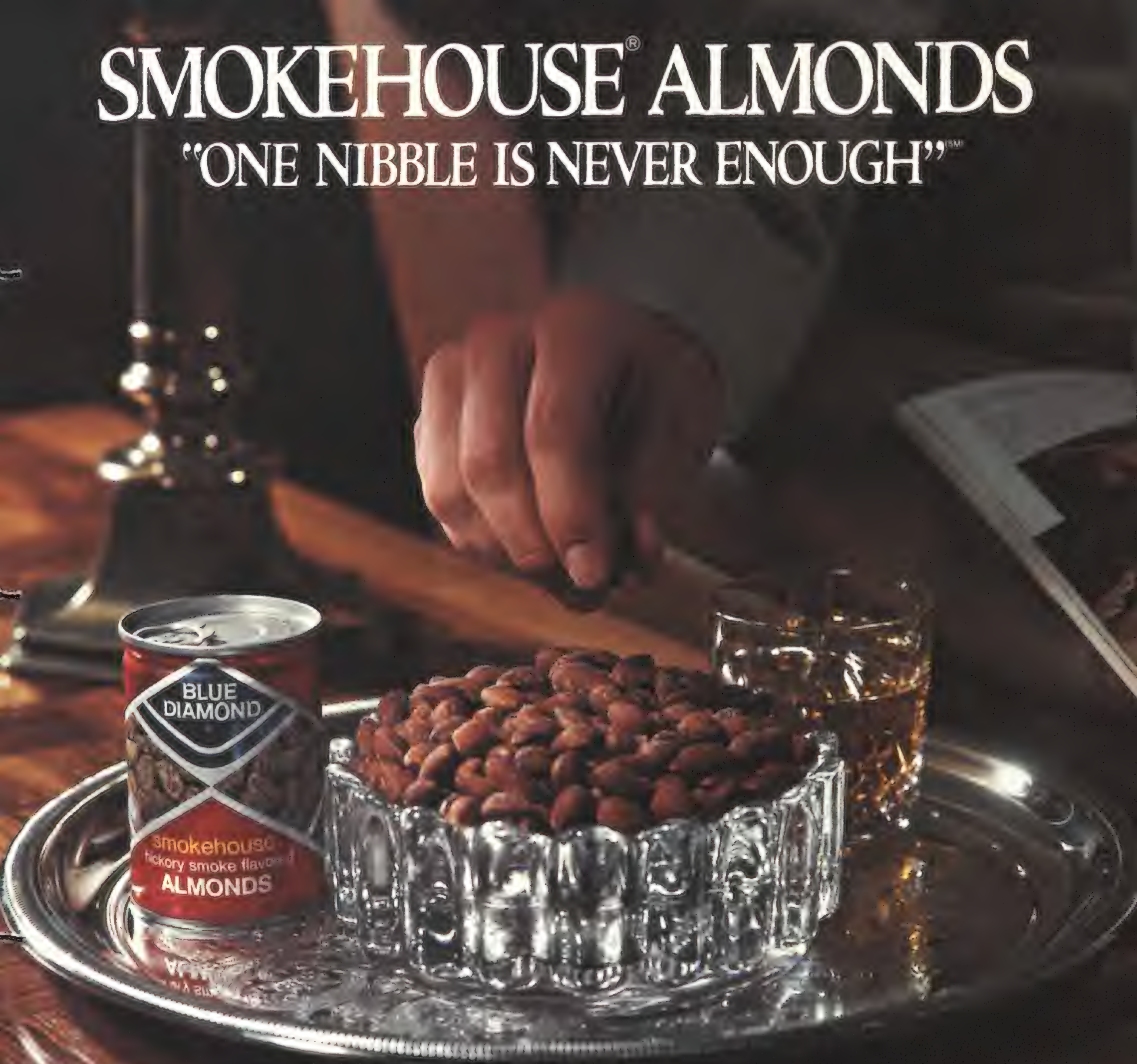


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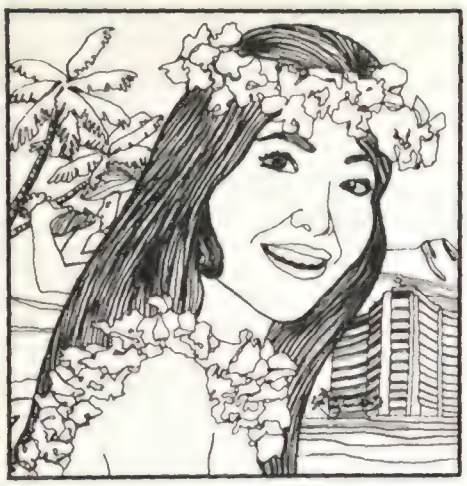

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*Nation's Attic,* which was unveiled on April Fools' Day, may not be as eye-popping as some of the other displays but it surely beats the kind of "junk" I have in my attic. I wish I could boast about the "trash" I cleaned my attic to discover!
*Jeff L. Daniels*
Northridge, California

Dear Sir: The picture of the tramp chair in your article on the *Nation's Attic* exhibit brought back childhood memories of my hometowns of Bingham and Moscow, Maine. The inventor of the chair, Sanford Baker, was a blacksmith in a nearby town and had relatives in Bingham and Moscow. One of these chairs was owned by these relatives who had boys of my age, and we used to take turns playfully being incarcerated in it. This chair, unlike your chair and one in the museum of the Bangor Historical Society, had a shelf on the front of the door on which the prisoner's food could be placed.

At the end of World War I, an effigy of the Kaiser was paraded down the main street of Bingham in the chair.
*Gregory Baker*
Orono, Maine

## *Draft horses*

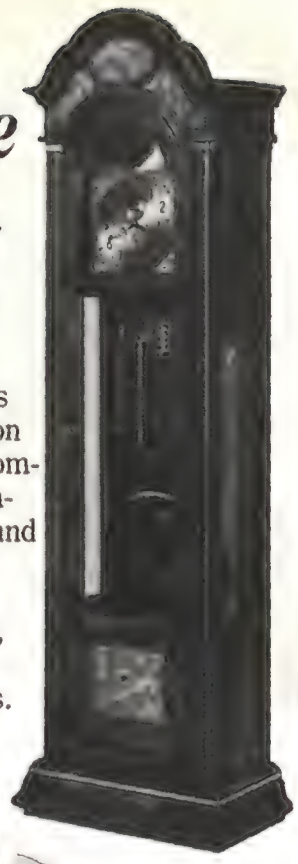
Dear Sir: I write in reference to Peter Chew's February article regarding draft horses versus OPEC oil as a source of power for our nation's farms.

First of all, I wish the article could have appeared while my old German father-in-law was still alive. He always told me tractors were just a fad and that someday the horse would come back into its own. I could hear his "I told you so."

I won't argue the economics of your Minnesota farmer, but I will say that the two horses I borrowed from my father-in-law when I started farming not only didn't say good morning, they usually weren't anywhere around when I came out. With any luck I had them located, caught, harnessed and ready for work by lunchtime. They also wanted to eat every day, not just the day we worked, as my tractor does.

You have mislabeled the corn picker—it is a wagon pulled by horses which may have corn in it. The picker is probably in another part of the field, and I bet it's being pulled by a tractor!
*John Ward*
Shabbona, Illinois


# *We make time a work of art.*



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**Limit: One collection per subscriber.**

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The World Wildlife Fund has assigned to The Franklin Mint the responsibility for crafting and distributing the collection. The spoons will be crafted for subscribers only, and only as a complete collection. There is a further limit of one collection per person.

Thus, the edition will be strictly limited to the number of eligible subscriptions entered on or before the deadline of June 30th.

**Final deadline for subscriptions: June 30th**

The Butterflies of the World spoons will be cherished not only by the present generation, but by those that follow. The collection will be issued at the rate of one spoon every *other* month. The original issue price is just $32.50 per spoon, payable in two monthly amounts of $16.25 each. And the fine hardwood display rack, designed to hold all twelve spoons, will be provided to each subscriber at no additional charge.

Each spoon will be accompanied by information on the butterfly portrayed. Subscribers will also receive a Certificate of Authenticity confirming the limits of edition.

But please note that, in order to acquire the collection, the subscription form below must be returned to The Franklin Mint, Franklin Center, Pennsylvania, postmarked no later than June 30th. Forms bearing later postmarks must, with regret, be declined.

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# *Phenomena, comment and notes*

*Body language on the bench, the price of gasohol, catching mind colds, and the taste of postindustrial crops*

The manganese found in nodules that litter the sea floor, as we all discovered a few years back, was *not* what Howard Hughes was looking for when he sent the *Glomar Explorer* out into the Pacific. But it might well have been, because manganese is a valuable metal used to harden steel and improve life in many other clever industrial ways.

Another element, magnesium, is also much overlooked these days, according to David Greenstock in *The Ecologist* (November/December 1979), which calls itself the "Journal of the Post Industrial Age." Magnesium, as with a vast list of other elements, is necessary for human and others' nutrition.

The generally accepted quantity is three to five milligrams per kilogram of body weight for a normal adult, but Mr. Greenstock asserts that twice as much is called for, and a deficiency will help you along to arteriosclerosis, cancer, thrombosis and various bone diseases.

Modern agriculture—which has trebled food production from land under cultivation—does so by the heavy use of fertilizers containing nitrogen, phosphorus and potassium-producing chemicals. The net result, says Mr. Greenstock, is that the plants take up too much potash from the soil, not enough magnesium: the plants and therefore the creatures that live on them are deficient in the needed metal, as is the soil itself before long. This is especially so among plants traditionally depended on to supply magnesium: certain nuts, cereals and fruits.

Food processing makes matters even worse. The magnesium in salt, for example, is extracted because it tends to store water. White flour, because of processing, has about one-fourth the magnesium of wholemeal flour.

It is high time, says Mr. Greenstock, joining a large chorus, that someone truly force the manufacturers of processed foods to give thought to nutritional value, rather than considering chiefly appearance, taste and texture.

There are those who would say that taste is no criterion in modern agriculture. One of these is James C. Boudreau, a taste physiologist at the University of Texas in Houston. First of all, he says in *The Sciences* (March 1980), any natural land food that tastes good is probably good for you (except for a mushroom, *Amanita phalloides*, that tastes "delicious" but "leaves you dead"). Secondly, the sense of smell is overrated as a determinant of how things taste. We are just finding out enough about the chemistry —and psychology—of the sense of taste to know that the old foursome (sweet, bitter, sour, salty) is too simplistic a way to think about it.

And just as we are beginning to understand the diversity of taste sensations and how they work, says Dr. Boudreau, along comes industrial agriculture to alter the chemistry of the crops we all enjoyed as we evolved, and to concentrate on high yield and ease of storage and distribution rather than flavor. We depend on fewer crops now, and these are further rendered inedible by such tricks as picking fruits when green and ripening them with ethylene gas (tomatoes are the worst example). The changing composition of soils impregnated with artificial fertilizer also affects taste—sulfur deficiency decreases the flavor of onions, for example.

It's not all impoverishment, however. Having reduced the diversity of food, the industry perhaps unwittingly is adding newer taste sensations. The chemical in use to make oranges easier to pick adds an "off-taste" to your morning juice. Indeed, many of the foods we eat contain agricultural chemicals that affect their flavor. For cosmetic reasons, these compounds are very high in fresh fruits and vegetables. No wonder they don't taste as good as they used to.

Now maybe someone will explain what

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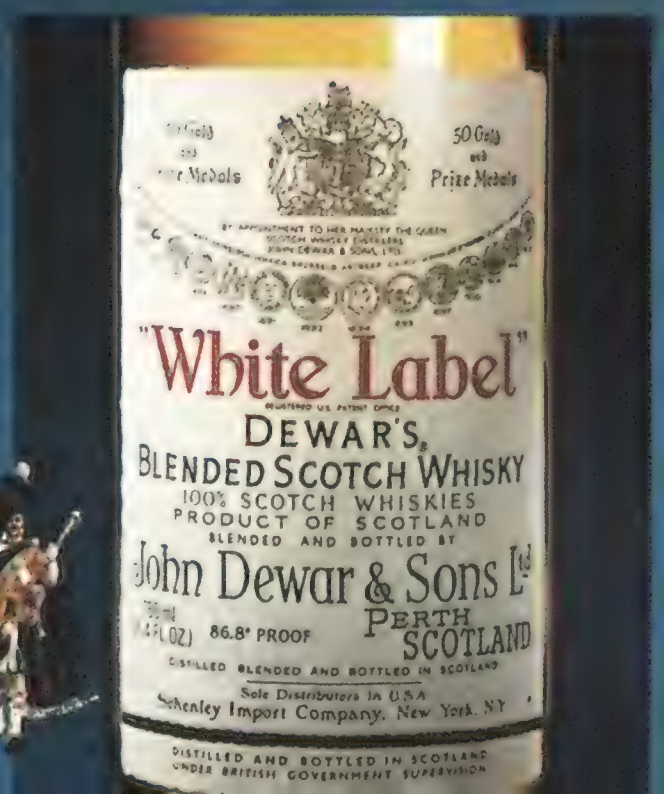


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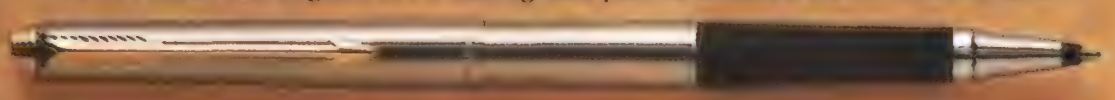

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nefarious new process it is that makes it necessary for me to boil an egg for five minutes to achieve the same effect my father did 30 years ago by boiling his egg for three minutes.

*Net energy alcohol*

Mixing alcohol with gasoline is getting to be all the rage—to the extent that the Worldwatch Institute in Washington, D.C., worries that Third World countries may turn badly needed food cropland into agricultural gas stations. There's a lot of interest on the part of U.S. farmers. You can make alcohol from sugar and they grow a lot of sugarcane in Louisiana, but two ecologists from Louisiana State University urge caution on advocates of fuel farming.

It takes labor, machinery, fossil fuel, fertilizer and insecticides to produce sugarcane (not to mention soil and such). Each of these can be translated into units of energy input. It takes equipment and steam—and therefore more fuel—to turn the sugarcane into alcohol. If you use fossil fuel to make the steam, then for every ten calories of energy you use to produce the alcohol, you would get *nine* calories from it—an energy sink. If you produce the steam from bagasse—waste products of sugarcane after the juice is extracted—you would get 18 calories for every ten spent—a better deal, but even then pretty thin soup compared with the nearly 6:1 ratio of gasoline from Gulf of Mexico oil.

"Alcohol from crops produced in excess of food requirements," conclude the ecologists in *Science* (January 18, 1980), "will not make a significant contribution to national energy needs."

*Muddling through a mind cold*

Researchers, it says in *New Scientist* (February 28, 1980), had found that "some heart disease could be linked with a reduction in social and work activity consequent on one or two stressful events during the previous year." Could such factors also affect colds? The very question was a kind of apostasy among establishmentarian thinkers about the common cold, who, if they know anything, seem to agree that the severity of cold symptoms depends on the existence of antibodies produced in response to previous colds. But it had to be asked: Is

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there something more to a head cold than meets the eye?

Richard Totman of the Common Colds Research Unit in Salisbury, England, gave colds to a lot of presumably willing people and found that introverts are likely to have worse symptoms. Also, people who generally live stressful lives but who, upon perceiving a bit of a cold coming on, drop everything, are likely to have worse symptoms—a case of self-pity, Dr. Totman explains with straightforward severity.

Whatever you do, these findings seem to say, regardless of whether you normally run fast or slow, the best course is to keep a stiff upper lip and stick to your guns when the rhinoviruses descend upon the scene.

*Body watching on the beach*

Body language—the gestures one makes, the postures one assumes unconsciously—has come in for a lot of attention recently. When a therapist and a patient are really hitting it off, they make synchronous gestures or movements in time with the rhythm of the conversation. Or they assume the same posture in their chairs. People have known about such stuff for a long time—perhaps instinctively. But when researchers find out something like this, pop psychologists often blow it up into simpleminded self-help best sellers. What was seen as diagnostic or therapeutic for the unfortunately abnormal becomes self-conscious strategy for the pathetically normal.

There are now eager would-be executives who altogether consciously mimic their bosses' gestures and postures in the expectation of beating out their peers on the promotion ladder. At least in part of this behavior, they may be the wooden-headed puppets they resemble, if you are to believe Dr. Geoffrey Beattie of the University of Sheffield in England.

A psychologist himself, he reports in *New Scientist* (March 20, 1980) on some findings that cast doubt on "interactional synchrony," the mutual matching of movements to speech rhythms. In a discussion group of six people, some strangers and some friends, researchers have found no more synchrony than one might expect from sheer chance.

More positive evidence seemed to exist for "postural congruence," but the question of chance still worried Beattie. Most


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# Olivetti Breakthrough

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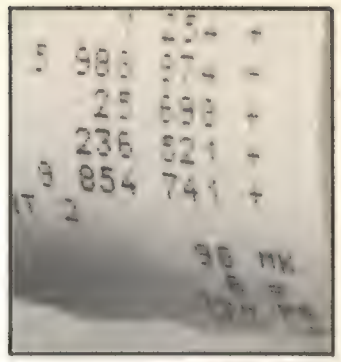

*The new pocket-sized Olivetti calculator slides open to unveil one of the most advanced printing heads ever developed.*

It's a major breakthrough. That calculator shown above is the most advanced printing calculator in the world.

### SLIP TOP PRINTER

The new Olivetti Logos 9 is only 1" x 2½" x 4⅝"—smaller than many cigarette packages. It has a full 12-digit liquid crystal display with add mode and full-floating or fixed position decimal.

To turn the unit into a printer, you simply slide up the top of the unit to expose the world's smallest and one of the most precise printing heads. The printing head prints letters and numbers, identifies each entry and even clearly separates groups of three whole numbers for easy readability.

### PLENTY MORE

If its size and printing head are breakthroughs, so is its paper system. The paper is loaded in special cartridges with enough paper per cartridge for 1300 entries. All you do is simply pop a cartridge into the bottom of the unit each time you change rolls. It's the most convenient way ever designed to change a roll of paper for a printing calculator.

But if you're like most Americans, you'd be concerned about paper supply. Where do you get those special cartridges, and how do you know if you can get them years from now?

That's where JS&A comes in. A 32-roll supply—all you'll ever need for three full years—is only $16. That's enough paper for 41,000 entries or approximately 52 line entries each working day for three full years.

But even more important, within one year stationery stores will stock the cartridges, and we predict that the Olivetti cartridge will become a standard in the industry.

### NO INK CARTRIDGES

The paper is a new type that looks exactly like conventional paper. But the paper, when struck, leaves a clear sharp image without the use of ink. So there's no messy cartridge required and no space needed to store one. You'll never need ink again.

The rechargeable batteries last for 8,000 lines when you use just the printer and 80 hours using just the liquid crystal display. The batteries can be recharged 500 times, so theoretically the batteries should last for 300 rolls of paper, or more than nine times the life of your paper supply. The batteries can also be easily replaced.

### POWERFUL COMPUTER

The features looked great. The world's smallest size, the paper roll convenience, the no-ink system, the battery life and the large 12-digit liquid crystal display were enough to convince us, but would the new Olivetti be considered a toy? Then we learned about its computational power and features which we feel are better than many of the most professional full-featured printing calculators.

**Speed** It's the world's fastest small printer with a speed of 2.1 lines per second. The unit also has a buffer so if you enter data faster than the unit, it will still print out each entry.

**Memories** The Logos 9 has two separate memories. One is an accumulating memory, and the other is a fully independent memory. And the display and printer indicate which memory is on the paper tape.

**Printing Head** The totally new printing head is a semi-alpha numeric system which labels all entries with letters to indicate the entry. For example LP is list price and CNT means item count.

**Clock** The unit is so complete, Olivetti even threw in a digital clock function. Your unit will display accurate time when the 12-digit display is not in use.

**Gross Margin** It automatically computes everything from gross margins to discounts and retail pricing. You just enter your percentage mark-ups in its memory, and it will automatically compute the results while retaining the formula and percentage in memory.

**Plus More** It has automatic round off, letting you select which figure to round off to. You can add a column of figures and then average your calculations automatically. The full-information liquid crystal display will tell you everything from when you're in the printer mode to whether you have something in memory and in which memory.

The technological breakthroughs in the Logos 9 were possible because Olivetti was able to eliminate the many interface components between the integrated circuit and the printing head. This was all made possible because Olivetti designed the entire system, not just a few of the components as is the case with most calculators.

So there it was. Great features, great convenience and great value for only $89.95 complete with batteries, charger and 90-day limited warranty. For $16 more, you can get 32 cartridges—all the paper you'll ever need for three years or for $10 more you can get 16 cartridges. So impresed are we with the Olivetti Logos 9 that we are making the following offer:

### FREE TRIAL OFFER

We urge you to test the Olivetti Logos 9 now. Order one for our 30-day no obligation trial. See the clear and easy-to-read paper tape and display. Use it as a pocket calculator, and carry it in your briefcase wherever you go. Experience the convenience of always having a printing calculator there whenever you need a permanent record of your transactions.

After 30-days of actual use, decide if you want to keep it. If you do you'll own the smallest, most advanced and convenient pocket printing calculator in the world. If for any reason you're not completely satisfied, simply return your unit within 30-days for a prompt and courteous refund, including your $2.50 postage and handling. You can't lose.

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To order your unit for our trial, simply send your money order or personal check for **$89.95** plus $2.50 for postage and handling (personal check orders, allow 20 days to clear our bank) to the address below, or credit card buyers may call our toll-free number below. Add $16 for 32 paper cartridges or $10 for 16 cartridges. (Illinois residents please add 6% sales tax.)

Who would have imagined a printing calculator this small and this convenient with this much computational power just a few months ago? The Olivetti Logos 9 deserves your test. Order one at no obligation, today.

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of the filmed evidence was from groups sitting in chairs and there are only a few ways human beings can sit in the confines of chairs. Professor Beattie sought a natural, unconfined environment where the number of postures could be counted with precision. Being no fool, he selected a beach in the South of France.

There he methodically observed ten male pairs and ten mixed pairs for five minutes per pair, noting their postures every five seconds. Twenty-three basic postures were noted—11 sitting, 11 lying down and one standing. It turned out that mixed pairs spent about half their time in congruent postures and male pairs one-quarter—both well above the chance level. Aha!

And what is the meaning of all this? It may be a symbol of rapport, talk being infrequent on the beach. Or postural congruence may be a public signal of a bond, a signal for others to keep away. This would explain the greater congruence in mixed pairs.

Clothing is reduced on a beach, notes the perceptive professor, and clothing can supply similar cues to group identity. Thus, he predicts, when other such "tie-signs are available the general level of congruence would be lower."

It's nice to think you can do science while staring at people on a beach.

*Territorial imperatives redux*

I myself missed a perfect chance to do *quantitative* research on Professor Beattie's prediction a couple of years ago, but my recollections bear him out. I had made my way fairly early in the morning to a beach on Kauai. To my total consternation I found that, as people began to arrive, some wore full bathing dress, some wore half and some none at all. My impression was that those pairs, mixed or unmixed, with no bathing suits at all, were usually in perfect congruence—either prone or supine, changing position only with angle of the sun. Those pairs with complete swimming costumes were not inclined to take the same postures—the women were generally prone or supine, the men seated, surreptitiously examining the topography of the beach.

A related phenomenon emerged from this research. The degree of beachwear had no effect on territoriality: regardless of their dress or lack of it, everyone (or every pair—call them *beach units*) simply selected a position equidistant from the nearest beach units, just like people on a regular beach, and just as seagulls do when several alight on a rooftop. There was no natural segregation by dress patterns on this beach. But noise could disrupt its tolerant human geography.

Late in the morning a couple arrived, found a spot equidistant from two beach units, stripped and began talking loudly. No postural congruence, either. Slowly, almost imperceptibly, other beach units moved away from the raucous pair, crowding themselves slightly. Anxiety behavior became apparent among them, a few half-dressed beach units donning the other halves of their outfits. After an hour or so, the noisy couple left and the beach units reassumed their symmetry.

You can check this sort of thing out yourself this summer. Just watch what happens when some idiot invades the beach with a transistor radio.

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*—Dr. John Boston, psychiatrist and Volvo owner, Austin, Texas*

John Boston, a Texas psychiatrist, owns a '73 Volvo.

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We wanted Dr. Boston's opinion of the new Volvo GLE, which has a full assortment of luxury features as standard equipment—and a price tag thousands of dollars below that of the well-known German luxury sedan.

"It's an excellent value. In my opinion, the individual buying this car would have a strong, unsuppressed need to get his or her money's worth. He or she would probably also have a strong enough self-image not to need a blatant status symbol."

When we told him that some people were actually paying five to ten thousand dollars more for a luxury car, Dr. Boston's response was characteristically succinct.

"That's not using your head."

Finally, we asked Dr. Boston if, when he was ready for a new car, he'd consider the Volvo GLE for himself.

"I'd be crazy if I didn't."

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# *Around the Mall and beyond*

It moves with aristocratic grace. Its saucerlike Jupiter ring rotates grandly, pitching and rolling gently under whatever strange forces are playing upon it. The motion is just enough to stir the tassels on the small boudoir lamps that mark its navigation through space and to agitate faintly the little chandelier behind the intrepid astronaut.

The astronaut, who is accompanied by a cat and a creature from some other planet, rises and sinks in the center of his festive craft as he puts his weight on the bicycle pedals that make it go. A tulip shape above him opens and closes its petals, their downward thrust obviously important to the maintenance of flight. The fragile wings in front stroke delicately up and down, providing forward motion. The paddle wheel-propeller astern, consisting largely of butterfly wings, spins serenely. There is no noise, no thud of blades or thunder of jets. Just a few bars of Edwardian music, not too loud.

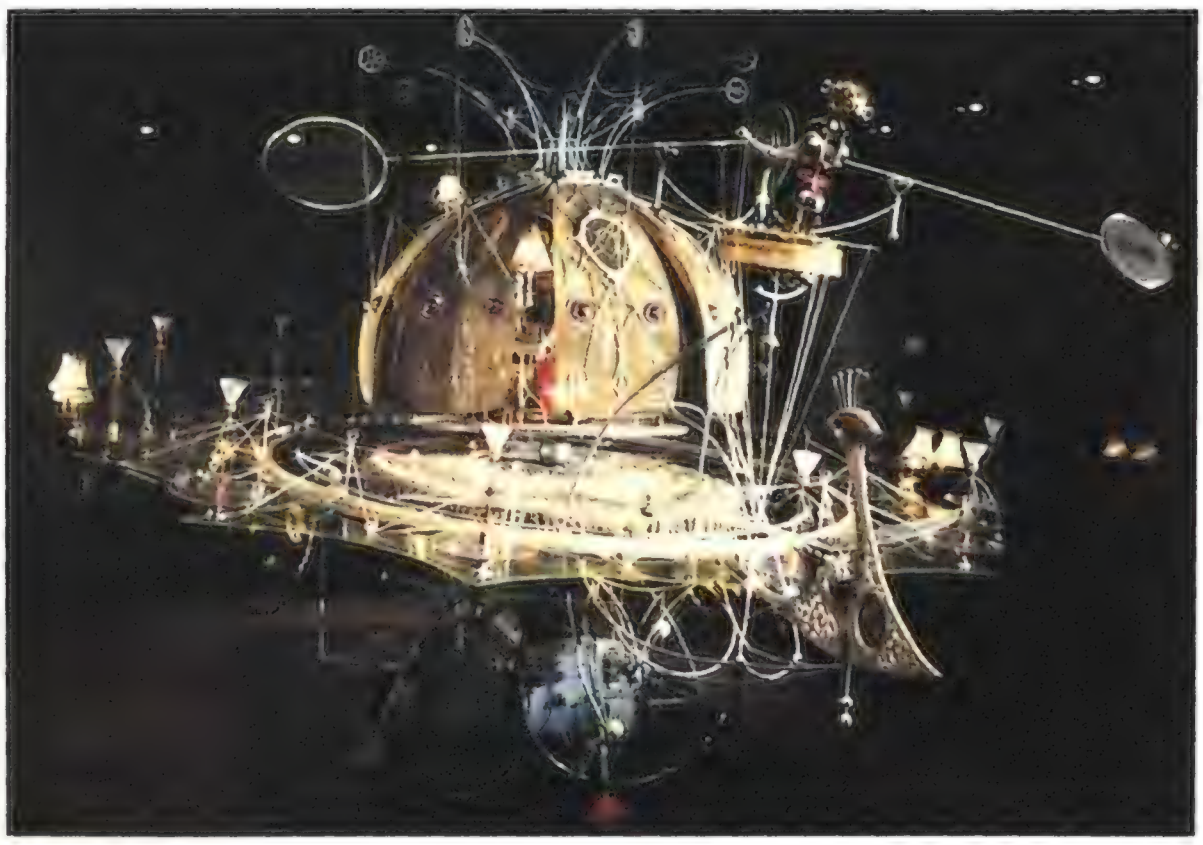
This splendid machine is, of course, S.S. *Pussiewillow II*, a spaceship (that's what "S.S." means) designed and built by Rowland Emett, that antic Briton whose *Punch* cartoons of cars and trains and planes eschew any hint of functionality in favor of undiluted frills. Emett, of whom we wrote in July 1973, calls his newest device "a projected Space Vehicle of an interesting Celestial Paddle-Boat configuration with Flying Carpet overtones." It occupies the upstairs part of the art gallery of the National Air and Space Museum. It's a delight to come upon it, endlessly waffling along with its little lamps and butterfly wings and elegant, moustachioed pilot peddling away, when you have just visited the space exhibits with all those sleek, bulletlike rockets and fiercely purposeful modules and landing vehicles.

Emett's inclusion in this museum is especially fitting just now. Not too far away from S.S. *Pussiewillow* is the new exhibit on early flight, of which this column gave notice last January. It places us in the midst of an aviation "fair," a series of showrooms and booths where the aerial products of 1913 are fetchingly displayed or pictured. And without intending it, these aircraft of that earlier, more gracious age certainly look a lot more like *Pussiewillow* than the Apollo 11 spacecraft.

I don't mean to imply that the knobs and protuberances of the Bleriot XI, the Curtiss Headless Pusher, the Wright Military Flyer and the Rinek Voisin (all of which are here in person, so to speak) are not functional. But so little was known of streamlining in those days that these planes might almost as well have carried lamps with tasseled shades on their wingtips. Richard Hallion, who with Tom Crouch and Claudia Oakes put the exhibit together, told me that the Voisin, for example, is so aeronautically awkward that it turned and banked simply by stalling out one of its great fabric-covered wings. "It's sort of a self-propelled box kite," Hallion said. Turning its rudder caused incredible "burbles" of air which sent the plane weaving around in semicontrol at best.

As cocurators, Hallion, Crouch and Oakes played their part in greeting visitors at the opening of the display. Hallion and Crouch answered all questions with affability while the early flight buffs wandered past the booths and posters that declaimed the virtues of the Wright planes over the Curtiss, or vice versa, the Antoinette over the Farman, or again, vice versa.

Claudia Oakes took her own private tack during the festivities. She is a student and admirer of Harriet Quimby, one of this country's first women pilots. Harriet was a journalist with a dramatic



S.S. (Space Ship) *Pussiewillow II* soars through Rowland Emett's universe.

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flair. She decided flying was her game and learned how in 1910. She became the first woman to fly the English Channel. She wore a satin flying suit—knickers that could be converted into a skirt. Claudia Oakes has written a book about Harriet Quimby and knows her well, so, naturally, at the Early Flight exhibit there was Oakes in a Quimby-type flying suit—satin, all in matching purple. Enough to make you sideslip into the corn patch.

Unfortunately, the real Quimby would not have been around for a 1913 aeronautical exhibition. A year earlier she got into some sort of trouble at a Boston air meet and, in the idiom of fliers, "bought the farm." At least *Pussiewillow* will never crumple to earth. Its pilot—an old Etonian if ever there was one—will never, *never* buy any farm.

Emett's train locomotives are just as ornate and unfunctional as *Pussiewillow*. They roll through a cartoon countryside with flowers nodding in the window boxes of the cab and an occasional canary swinging in its gilt cage above the engineer's head. And the engineer, according to the captions, is of course never quite sure whether he is heading for Upper Shrewstongue in the Wold or Much Crumpet in the Bogg.

Such locomotives have been a part of British life for well over a century, for the notion of trains got up steam in the Midlands when iron and coal abounded and produce needed to be taken to market. Here in the States we had some locomotives just about as old. It's hard to say, surely, who can claim what along that line. But, anyway, we have a splendid old Rowland Emett-type locomotive on the second floor of the Museum of History and Technology. It's called *John Bull* and it's one of the world's oldest.

Because the *John Bull*'s 150th anniversary is on the way (it's in 1981), John H. White, our curator of transportation, decided to start up *John Bull* just in case its ability to run might be a factor in future plans. He and John Stine (the engine expert who introduced me to the power plant of the long-submerged *Indiana*—January 1980 issue) and Larry Jones got to *John Bull* before most sightseers were even awake, jacked up the drive wheels, fitted a compressed-air pipe to the cylinders, oiled the throttle and gradually opened her up.

White says there was a tremendous

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blast of dust from the ancient cylinder—a monumental throat clearing, you might say—and then the engine clanked and rattled and the wheels turned. Oil, judiciously added at the right places, reduced the clanking to a pleasant ticking. *John Bull* was running like a Rolls-Royce.

White and Stine didn't keep it going very long for fear it might throw an ancient piston rod. Anyway, the museum was ready to be opened soon and it would never do for the visitors to catch curatorial types playing with their trains.

Jefferson Davis, President of the Confederate States of America, also apparently liked trains. We have, somewhere in that museum, a porcelain train that was made for him. It's really a coffee maker. The boiler of the locomotive serves as the water container, and the smokestack has a spigot, I think, and standing upright along the fuel tender, just like the logs of wood that were burned in the firebox in Jeff Davis' day, are six cigars.

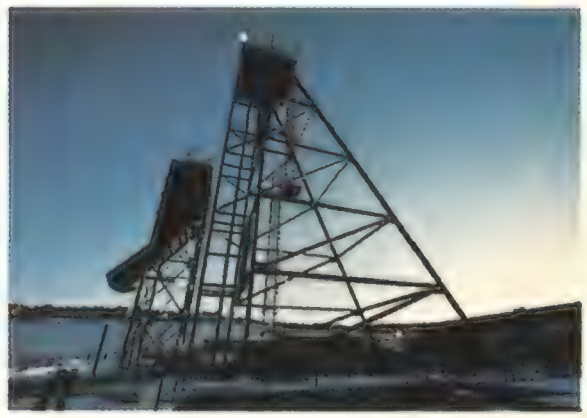
I believe that's the way it is arranged. The fact is that I passed this exhibit once, somewhere near the First Ladies, and I hauled up short, charmed by it. And since then I haven't been able to find it again. Whenever I get near the right area in that vast and still only half-explored museum, I spend a few minutes rushing around looking for a neat little porcelain engine. I brush past sightseers lining up to look at the First Ladies, I overtake strollers entering "We the People," I hurdle school groups, all clutching each other's sweaty little hands, all about 18 inches tall, swirling around their teachers like waves around a lighthouse. And if anyone asks me what I'm doing I call out, "I'm trying to catch Jefferson Davis' train!" and then disappear down a hole like the White Rabbit.

Steam engines *do* have charm. Years ago this magazine ran an article about the steam cars being developed by William Lear (June 1973). He had a successful truck, and then he let the project slide because the problems of steam automobiles seemed unbeatable.

Recently, on a vacation trip, I saw a well-developed steam car system being improved and tested in Australia. A youngish engineer named Pritchard has, with the help of his wife, put together a steam power company and has got an engine that works beautifully in a car. Under the hood is a round boiler stand-

# "We got this oil by cooking rocks."

"Cooking isn't exactly the right word," says Gulf engineer John Selters. "Actually we heat the rock – oil shale – to about 900°F. The heat releases a kind of oil called kerogen. The idea is to refine the kerogen and use it instead of petroleum.



*"The oil shale is mined 800 feet down."*

"There are huge oil shale deposits in America. According to some calculations, these deposits contain as much oil as there is in the Middle East.

"Gulf and another oil company are equal partners in a project in Rio Blanco County, Colorado, to make shale oil a practical alternative to expensive imported crude oil.

"It's a costly proposition. We're still at the development stage and production is years away. But we'll need the oil then even more than we do now.

"Of course Gulf is still working hard to find and produce all the domestic petroleum and natural gas we can. But we're also working hard on alternatives. Oil shale is just one of many. It takes energy to produce energy, and at Gulf we're giving it our best shot."

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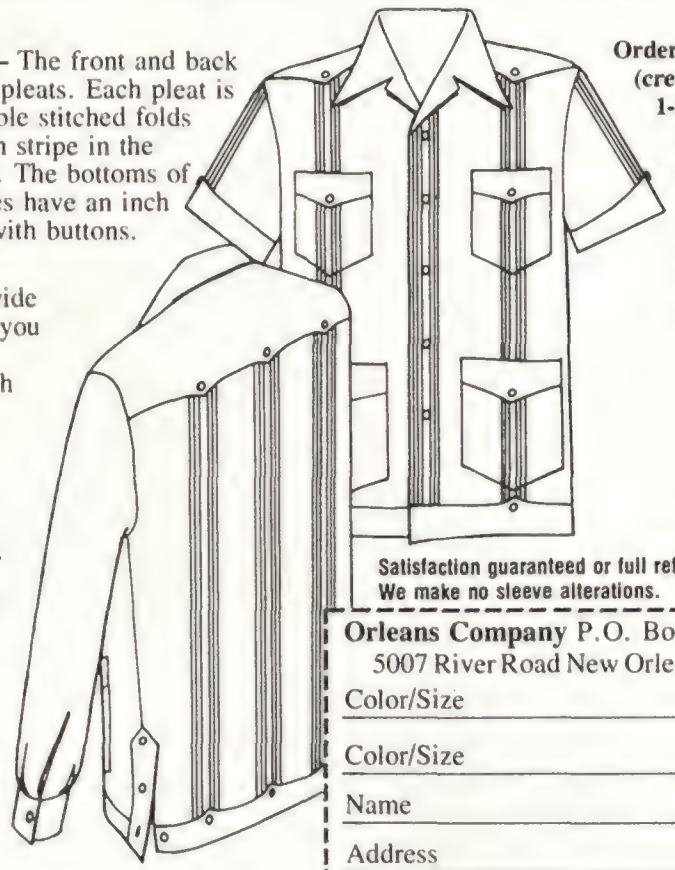

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ing on end. Behind it are the two cylinders in a V. Pumps keep water flowing through the boiler pipes and fuel feeding into the combustion chambers.

According to Pritchard's specifications, his newest, most refined engine takes 45 to 50 seconds to get up steam, will hit 85 miles per hour without use of a gearbox, runs quietly, pollutes not at all. So what's the catch? Well, the catch is that fuel must be used to produce the steam which runs the car. Admittedly the fuel can be a variety of kinds—alcohol, gasohol, kerosene or other fuel of lower volatility than gasoline. But the fact remains that the car gets about 25 miles to the gallon. And so do a lot of other cars. Many get better mileage. So how does a steam man prove that fuel should be used to produce steam to run the engine instead of being used *directly*?

I don't know. Mr. and Mrs. Pritchard don't really know, though they see a large hope of improving their fuel economy. Basically, one is interested in steam cars because one loves steam cars. Pritchard admits that his father owned a Stanley Steamer—that famous machine that won auto races in the early part of this century. Since then, Pritchard has been in love with these engines. A great deal of the work he has done with them has been for fun. He's obviously an outdated, inefficient dreamer. I hope the world always has room for a few million like him.

—EDWARDS PARK

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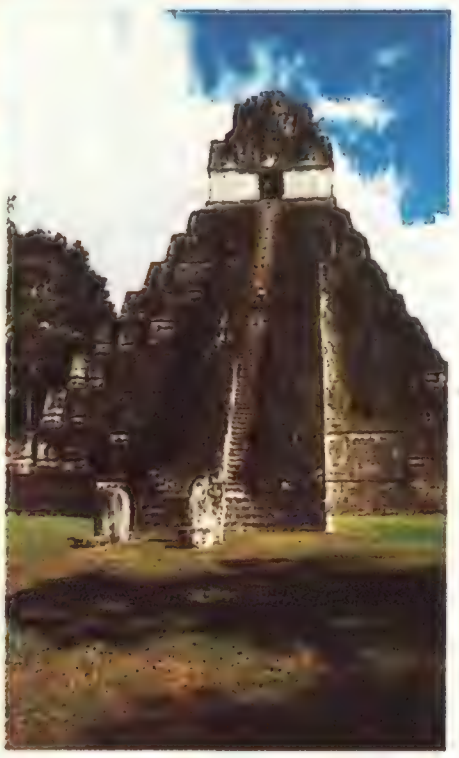

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James Beach/Donald Perry

*Article and photographs by Donald Perry*

# An arboreal naturalist explores the rain forest's mysterious canopy

*In a nearly inaccessible realm of towering treetops, animals make highways, branches 'fight' for sunlight and lizards may glide*

A bird never before seen at La Selva in Costa Rica, the Great Potoo perches on canopy limb, 120 feet high.

A violent lurch and awesome crash awaken me from a deep sleep. At first I forget where I am, then I remember. I am more than 100 feet above the ground on a treetop research platform at Finca La Selva in the rain forest of Costa Rica.

The platform rocks like a boat in a turbulent sea. Around me hanging plants come loose and fall, crashing through the tops of successively lower trees until they finally thump against the ground.

In the total darkness I trace out the connection to my safety belt with my hand, making sure I am still tied to the tree. Somewhat reluctantly I lie back down, knowing what to expect from storms like this. Often they are very destructive.

Above the wind's roar comes the sound of a tropical downpour. It is torrential and advancing my way rapidly. From somewhere on the right side of the platform I hear the chilling creak of tearing wood. I tense automatically, waiting through that brief moment when only the rain can be heard. Then comes a tremendous noise, like a freight train crashing through wood-frame houses, followed by a jarring shake. A forest giant slams into the earth. Others, like dominoes, fall in its wake, their limbs snapping with loud reports.

Then, as suddenly as it began, the storm is over and the wind subsides. All that can be heard is the monotonous, soothing patter of rain against my plastic roof. Dozing off, I imagine I have become like the animals that live here, accepting the omnipresent dangers and risks of this elevated environment.

What brings me to this place known as the canopy of the tropical rain forest? A brief explanation of the canopy will help answer this question.

The Earth's biosphere is divided into several major habitats: the aquatic, terrestrial, subterranean and

In the precipitous Sarapiquí River gorge, Perry ascends into Costa Rican tropical canopy by rope.

In canopy, many limbs at lower and intermediate levels are overgrown with a thick burden of epiphytes.

On canopy limb used by animals as arboreal highway the foliage is matted down by the four-footed traffic.

aerial. So stringent are the requirements of life in each region that its respective organisms generally are as ill suited to other habitats as "a fish out of water." To the list we must add another habitat, less known than the rest, whose selective forces have placed an indelible stamp upon its present and past inhabitants. This is the arboreal realm of forest treetops, which is known as the canopy.

All forests have a canopy, but none can compare in complexity with the rich community of plants and animals found high in the rain forest treetops. This is a hidden, unexplored world of natural history and ecological interest. It is a layer of vegetation that starts at around 30 feet up and may extend to more than 150 feet above the ground.

Often huge limbs stretch out horizontally like the tentacles of an octopus to interlock with the crowns of neighboring trees. Lianas (woody vines) also weave among them; in effect, the trees become united in an aerial lacework, forming a sort of roof over the rest of the forest.

Observers on the ground will have a difficult time if they want to study the roof. Low-lying vegetation from 6 to 30 feet tall grows very thick, almost totally obscuring a view of life higher up.

This is frustrating because the wealth of information held within the canopy overshadows that of any other forest region. The majority of the forest's food is produced here. The multitude of canopy plants is the first vegetation layer to intercept the sun's light. Relatively little light energy makes its way to the floor.

*The canopy's hanging gardens*

Long evolution and the tendency for life forms to seek out environments with high levels of usable energy have resulted in odd, unconventional flora and fauna adapted solely to the canopy. Tree limbs may have lush overburdens of exotic plants. These hanging gardens are composed of epiphytes (plants that grow on other plants without parasitizing them) such as orchids, cacti, ferns, bromeliads, mosses and many more. Some of these plants have quite beautiful flowers, while the plants themselves are tolerant of low light levels and sporadic periods of wet and dry. It is only natural that many of them have found their way into millions of homes across the country.

The canopy is the forest's "main level," while the ground is its "basement." In the basement, temperature remains constant as does humidity. Extremes in both are buffered by blankets of vegetation: temperatures remain close to 80 degrees F while relative humidity is 80 percent or above.

Many animals seem to have abandoned the ground for the food and light high above. The insect commu-

nities of the canopy are reminiscent of insect life in the fields. Bees, ants, flies, dragonflies, butterflies, katydids are all there and in abundance, especially around flowering trees that in some ways are similar to a field of flowers. Many of the insects stay on these elevated flower fields and never or almost never make their way down to the ground.

A surprising number of animals that are typically ground dwellers also have relatives that make it into the treetops. Mice, scorpions, centipedes, cockroaches, ants and springtails are there. Even animals that are not thought of as climbers are present. I have seen earthworms burrowing in the humus on limbs more than 90 feet up.

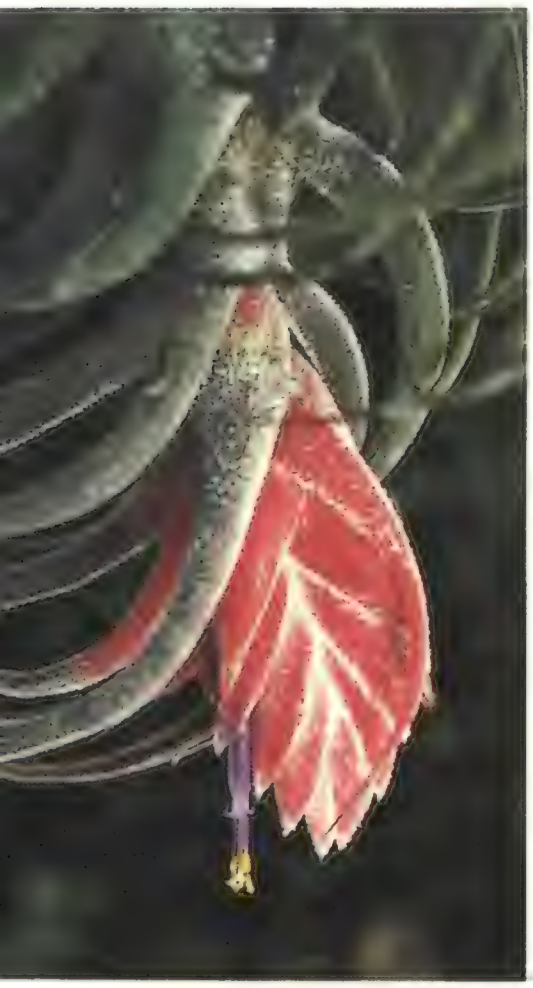
A typical tropical rain forest has hundreds of species of trees. For example, at Finca La Selva there are over 300 species. A comparable area of forest in temperate regions would only have about 50 species. Usually, individual trees of a given species are separated by large distances, so a given area of forest can vary considerably in its composition of species from place to place.

With its richness of flora and fauna, as well as its accessibility, Finca La Selva has become a unique outpost where several hundred biologists and bird watchers gather each year to study the tropical rain forest. Yet, like any other small piece of virgin forest, Finca La Selva's 2,000-acre reserve is in danger of becoming a virtual island surrounded by agricultural development. Fortunately, Costa Rica has set a high standard for the establishment of parks for scientific research (SMITHSONIAN, September 1979). An exciting plan is now before President Carazo that would extend the giant Braulio Carillo Park to Finca La Selva, insuring its survival.

Despite the overwhelming importance of the canopy, it has remained largely unexplored. Usually exploration of new regions has depended on vehicles such as horses, boats, diving bells and spaceships. But the canopy is a twisted maze that admits few vehicles, and immobile structures such as treetop towers and platforms are grossly inadequate to explore effectively this heterogeneous habitat. To study it effectively we must take a step back in time. We must reclaim some of our past.

In 1974 I decided that in order to study the canopy we must rely on the trees. In short, it was necessary to climb them. At that time, some people were climbing trees for various purposes but the methods they used were cumbersome, slow, and required more than one person. As I would be working alone, I had to devise new methods.

The obstacles were major. The first limbs of some trees I would be climbing were between 70 and 90 feet up, frustrating any attempt at directly climbing them.



Spectacular forest plants include (left to right) a hummingbird-pollinated bromeliad, a *Sphaeradenia* whose bloom lasts only a day, and a *Siparuna* whose striking fruit attracts birds that disperse its seeds.

*Exploring the rain forest's canopy*

A sloth, green with algae, shares tree with Perry, who snapped it seven feet away, 60 feet above ground.

Beetles swarm the cascading inflorescence of Pejibaye palm in forest clearing at night, disappear by dawn.

Also, the trunks and branches were homes for many types of poisonous animals.

The method I settled on was to use a crossbow to shoot a fishing line over the tree's crown, and then to raise a strong rope into the canopy. I climbed the rope directly, using mountain climbers' devices called ascenders—special clamps that slide easily up a rope, then lock into place so that they cannot slip back down. One ascender supported a harness while the other supported two stirrups for my feet. Standing, I could raise the harness ascender. Then, sitting in the harness, I could pull up the lower ascender, moving my feet farther up the rope.

In practice, the method worked perfectly, and soon drew the attention of other tropical scientists who wanted to conduct research in the trees (SMITHSONIAN, March 1979).

The tree-climbing method proved to be a powerful new tool for investigating the tropical forest canopy. Interesting revelations of natural history were commonplace. I found animal-plant interactions that I had not anticipated.

In morning, long-beaked Oropéndola, perching on Pejibaye inflorescence, feeds on tardy beetle (in beak).

In one tree (*Lecythis costaricensis*) I found animal paths up to 60 feet long. They formed corridors through the thick overburden of plants growing on limbs and were maintained by continual traffic. Animals likely to use the paths include White-faced monkeys, Howler monkeys, Spider monkeys, kinkajous and marsupials. Paths or arboreal "highways" may be common features where preferred routes exist between nests and feeding sites. Paths of all sizes are possible. At least one species of tiny ant (of the genus *Crematogaster*) maintains its own two-to-three-millimeter-wide foraging paths.

In a forest on the Pacific coast of Costa Rica I found a huge hollow tree (*Anacardium excelsum*). The only entrance to the vertical cavern was 50 feet above the ground and large enough to climb through. The interior was spacious and housed numerous animals that are only occasionally seen by rain forest visitors. Hundreds of three-inch cockroaches clung to its moist walls along with crickets, scorpions, centipedes, whipscorpions, pseudoscorpions, a marsupial (*Marmosa*), a climbing tree viper and hundreds of bats. The bats' feces provided the nourishment for much of this natural menagerie and its influence was also apparent on the outside.

The fertilizing effects of guano resulted in a trunk covered by thick carpets of plants, unmatched in luxuriance by any other tree in the area. I was reminded of an intriguing and controversial theory. Tropical soils are low in nutrients, yet the tree had its own private supply which could be carried down to its roots. Maybe the tree had a genetic basis for hollowness, ensuring adequate nutrient supplies by attracting and sheltering one of the forest's best nutrient sources—bats.

The differences between ground-level and treetop communities are based upon a gradual change in microclimate that comes with increasing height above the forest floor. This becomes apparent on climbing up one of my ropes.

Odors of fragrant flowers and decaying vegetation seem to hang motionless in the forest floor's unmoving air. Mosquitoes with weak powers of flight are well-suited to this still sea. They swarm around me relentlessly, held off by insect repellent.

Little changes until I force my way through the lowest dense layer of leaves at about 25 feet up. Visibility increases and the dark underworld is left behind. Flowers that were hidden come into view and the air holds tantalizing fragrances from above.

The mosquitoes that had been following me stop. They do not rise out of the forest basement. They remain near the ground, as do many other insects, like benthic organisms of the ocean's bottom.

I am in a new zone of wide open spaces interrupted by the tops of medium-size trees. The air is a gently ebbing sea, set in motion by the strong gusts that often wash over the forest's upper surface.

Nickel-size poison-dart frog peeks out from the cup of a bromeliad. Perry found frogs on 30-foot-high limbs.

An iguana hides among vegetation. Iguanas share tree world with mice, monkeys and even earthworms.

Bats cluster inside a giant hollow tree, a habitat also occupied by tree vipers, scorpions, cockroaches.

A new set of biting flies zeroes in on me here. These are strong fliers. They must be to cope with the air's stiff currents. An emerald-green-eyed tabanid, of the horsefly (Tabanidae) family, buzzes around my head, lands on my shirt and tries to force its proboscis into my skin. Quickly I snap it up with a small insect net I usually carry.

Also strong fliers are the metallic blue and white mosquitoes the size of 25-cent pieces that dart warily around my head. These are fearsome-looking creatures quite unlike the relatively docile mosquitoes of the forest floor.

As I climb higher, the crowns of the medium-size trees unite to hide the ground. In comparison to the thick hanging vines around me, my thin rope looks dangerously weak. These vines are aerial nutrient and water conduits that jut upward to massive arboreal shrubs growing in the crowns of huge trees. Some of these shrubs in fact are 20- to 30-foot trees that are resting on the backs of their giant hosts.

Hanging 80 feet up in the virtual empty space above the lower vegetation and below the tops of the highest trees can be an unnerving experience. The ground is far below and I cannot always keep a clear head; fear of falling may overcome me. I force myself not to look down, but even looking up is unsettling. The nearest limbs are still dozens of feet above and it's nearly impossible to look at them without questioning the strength of the supporting branch. Continuing up is difficult because each foot seems to increase the risk.

My fear subsides once I enter the crown of a giant tree. Strong limbs nearby offer a safe place to stand—an arboreal *terra firma*. The limbs can resemble overcrowded lifeboats; their upper surfaces are choked with plants, clinging to the edge. Cacti, ferns, orchids, philodendrons and many more hang on tenaciously, in this realm of high energy and rapid growth.

High winds regularly buffet this zone. When they arrive debris is knocked loose; fruits and living plants are torn free and limbs are broken. All crash through the crowns of lower trees and in turn knock other organisms from their meager footholds. Inevitably my fear returns, for safety does not exist in the canopy—only its illusion.

I soon realized that to understand the canopy and its animals it would be necessary to live there, so I built a four-by-eight-foot roofed platform at Finca La Selva, a field research station owned and operated by

*Tropical biologist Donald Perry worked on this article with writer Sylvia E. Merschel. Together they are writing a book about the rain forest canopy.*

the Organization for Tropical Studies. I lived there for many days and nights. It was during those long isolated hours, when I watched monkeys running and jumping from tree to tree and all manner of birds and insects flying among them, visiting widely spaced flowers and fruits, that I began to feel restricted.

Most canopy trees are not suited to support a heavy primate such as myself. The sturdy emergent trees that I could safely climb stood like islands in a changing sea of weak unclimbable trees. The latter are the most common trees and major sites of animal activity and ecological interactions. The trees and other plants play a life-and-death game. Forsaking strength, competing to be the first to reach a place in the sun, the trees grow tall and thin. They try to expand, with fast-growing leafy branches, into as much canopy space as possible.

Epiphytes and other canopy plants have clever strategies. They are supported by host trees, and need not invest in an expensive column of wood. But the problems they must overcome are great. Some trees may shed their bark in order to avoid a heavy burden of epiphytes that could snap a limb and set the tree back in the race to the canopy. Apparently the battle is a close one, because the forest has a continual rain of falling epiphytes and broken limbs.

Some of the broken limbs can actually be traced to "aggression" between trees. Where limbs are crossed, a rubbing battle ensues between trees. Like wooden saws they dig at each other under the wind's push until one, usually with the softer wood, falls. These battles are endless. A victorious tree can be overrun by rapidly growing vines that totally cover its upper surface or it can be strangled to death by a *Clusia* that starts life as an epiphyte and later encases its host in a smothering armor of aerial roots that becomes a cylindrical tomb.

The "to the canopy or bust" urge has left these trees vulnerable to another and more serious forest phenomenon: tree toppling. Some trees *do* "bust"—they are uprooted because they have only a meager grip on the ground.

A high rate of tree fall has an impact on forest ecology. Light gaps form where trees and large branches come down. Numerous species are adapted to and are only found in gaps. These grow quite tall before, through succession, they are supplanted by different species. Rain forest diversity is thereby increased.

Where gaps form, the canopy can become destabilized to favor gap expansion. Top-heavy trees left standing at a gap's edge are in trouble. They are no longer embedded in the canopy and protected from strong winds by a continuous layer of leaves. In a severe

Its body overgrown with a fungus that killed it, rain forest ant died while furiously biting into leaf.

wind, limbs break and these exposed trees fall, advancing the periphery of the gap a step further.

To explore these areas of weak trees required something new—a means of reaching every point of a 90-foot-tall tree while not using it for support. The solution loomed on the skyline 100 yards away from my platform. At my right and left, two emergent trees jutted above the surrounding forest. I reasoned that these along with my platform tree could support an aerial network of ropes from which I could hang into the canopy. In the fall of 1978 I returned to California to devise the necessary equipment.

Later I designed the structure with John Williams, an engineer. In March 1979 we traveled to Costa Rica to construct it. The gleaming white ropes suspended in their geometric pattern above the trees reminded us of a spider web so we began calling the network a "web." The web is used by sliding on a pulley along one of the taut ropes to a desired position above a tall tree. Using climbing methods, I can descend, on a rope carried with me, to any point below. Because the ropes are adjustable, they actually can sweep over almost a whole acre of forest. Now for the first time I could reach every square foot of my study area.

It is still too early to give a reliable description of the forest that became accessible by the ropes. But I began various studies which will give us badly needed information concerning the pollination ecology of canopy plants—information that was virtually impossible to obtain before.

Throughout my canopy research I began discovering rare animals with little-known life histories. Among these was a bird that had never been sighted at La Selva before, even though the spot is a major bird-watching area of Central America. As I was scanning the treetops with binoculars, I thought I saw a bird on the limb of a leafless pea tree that was budding flowers.

These membracids (treehoppers) are common canopy insects that cling to small limbs and look like thorns.

At rest on a banana leaf, this canopy moth has transparent "veined" wings to mimic tropical wasp.

Caterpillar on decaying banana leaf has poisonous spikes, and bright colors to warn off its enemies.

It was very difficult to be certain because the bird's plumage matched identically the lichen-covered branch on which it sat, and it did not move (p. 43). The only way to be certain would be to explore the tree. It was for this type of situation I had developed my method of tree climbing. But even after a closer look I had no idea what type of bird it was. It had a small beak, a huge mouth, and the face of an owl. The mouth perhaps was its oddest feature. When open, it was a gaping hole that hinged way behind the eyes. Was the bird a juvenile? Yet it was about 18 inches long and its feathers appeared to be adult plumage. I photographed it, one of the only times the bird has been photographed in its natural habitat.

The mystery was cleared up by F. Gary Stiles at the University of Costa Rica, who identified the bird from a verbal description as the Great Potoo (this is not to be confused with the Common Potoo).

A message was sent to me. Unfortunately it came at a time when I could not find the Great Potoo. Subsequently I was able to see it for a brief period and then it was gone.

The Great Potoo exemplifies well how the canopy conceals its inhabitants. Even though its call had been heard—and had even awakened some baffled La Selva biologists with its strange nocturnal cry—this large, impressive bird went unseen for decades; and still only a few scant facts are known about its life history.

*A world of mimicry and camouflage*

This is not an isolated incident. The profusion of vines, leaves and branches is so dense that the most striking and frequent of rain forest animals are inconspicuous. Macaws, with their bright blues, reds and yellows, magically become invisible once they land in a treetop. Even large hawks that scream out their location cannot be seen easily. And it is an almost hopeless task to search for smaller vertebrates and insects.

Observation of animals has been made difficult by camouflage. Most animals must be wary of predators. Through evolution many have come to look like plants: katydids mimic old and new leaves, walking-sticks look like small branches, frogs resemble leaves; the list is endless.

Three-toed sloths have a unique type of "camouflage." They are so slow that their movement attracts little attention. This "slowness" seems to have spilled over into other areas of their behavior—grooming of fur is practically nonexistent. Sloth fur, which is extremely dense, is a microcosm of tropical life. One I saw was turned green by dense growths of algae and crawling with its own species of moth (p. 46). I slapped its back and, like dust, a cloud of moths rose in the air. It's best not to get close to a sloth, though, because

*Exploring the rain forest's canopy*

contrary to its well-earned image, it moves more quickly when threatened. It has powerful claws and long, sharp canines that can inflict severe wounds. A sloth's passivity and colonized fur make it very difficult to find among the forest's ubiquitous clumps of hanging plants.

Near the tops of 150-foot-tall trees I found some small *Anolis* lizards with very unusual behavior. A bright flash of rose-pink marked my first sighting of this creature. The color came from the extension of a dewlap, the loose piece of skin under the chin and throat of *Anolis* lizards, which is used for lizard communication. Was it warning me that I was invading its territory? Not likely. Another *Anolis* lizard, or anole, was probably nearby. The anole soon ran up a limb and out onto a leafless branch of the blooming emergent tree in which we both sat. A breeze rocked the branches gently. I thought of the ground more than 130 feet below but could not see it. The emergent's trunk had been engulfed by the opaque top of a smaller, 100-foot tree.

Another rose-pink flash. This time it was nine feet below the first. A second anole appeared. It could change its external coloration and now it matched the mottled bark. I sat frozen, not wanting to disturb the action.

The first anole leaped into space. Where was it going? There were no close branches to land on. It dived at about a 45-degree angle and landed ten feet away on the trunk. How did it do that? It should have been blown off course by the wind. Did this animal have control over its direction? I was puzzled. The Neotropics were not thought to have lizards with this ability. I doubted what I had seen. But not for long.

A third, previously unseen, anole appeared at the same "diving" twig. Fortuitously, I got a replay of the action. This time I was ready to watch for behavior that could account for aerial maneuvering. The anole jumped, bent its body sideways as if it were counteracting the breeze and, amazingly, it landed within a foot of where the first had landed. Now I had few doubts. And as if to underscore this newly discovered ability, the one remaining anole followed the others, seemingly in pursuit.

Subsequently I have seen other incidents of aerial behavior, but I have not been able to catch one of the anoles. This leaves their full scientific identification unknown. I will keep trying to catch them, however, and eventually we should know more about these interesting animals. I now suspect that there are gliding lizards in the Neotropics in the form of small nondescript creatures hidden in the treetops, but only a complete study of their behavior will prove this.

For me the canopy is more than an outdoor laboratory. It is a personal experience, an uncontrolled experiment at recapturing some of our lost evolutionary past. There is good reason to believe that long evolution in the trees gave us grasping hands, general body shape, a disposition to bipedalism, a dependence on vocalizations, vision and binocular sight. But most important, our intelligence, along with its engineering and brain circuitry, was forged by the canopy's evolutionary mill.

Perhaps the ancient myths of the Tree of Knowledge and the Tree of Life extend into our cultural prehistory. Do these represent a deep-seated recognition of the influence our lost home had on our psyches? I believe that we owe our intelligence and probably self-awareness to the trees.

My work in the canopy has also turned into a search for myself and an attempt to reopen vestigial areas of the brain. The first time I climbed a huge tropical tree into the canopy I was overcome by my feelings. I felt I almost could be Man's arboreal ancestor. As I walked on animal pathways on the upper sides of overgrown limbs, it seemed both a new and an old world!

Here time has stopped. It is as it has been since the dawn of the age of mammals. The ancient pressures are still at work, still molding and shaping the animals within their domain. The animals and plants are part of the show. Each adds its special twist and talent. Together the canopy is an interdependent whole.

For the present, I have returned to the trees to live in them and work in them; to study the fascinating animals and plants; to develop new techniques that will aid in their study and most of all to save them. We owe more to them than can ever be imagined.

Donald Perry peels a banana in his canopy tree house and research platform on a limb 100 feet high.

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The Brandy of Napoleon

Van Gogh painted *The Novel Reader* in Arles in 1888 while under Gauguin's influence. Compared with his other work, it is simpler and smoother in execution, but still strongly ablaze with his private intensity.

Louis Franck, Chalet Arno, Gstaad

*By Bennett Schiff*

# Fresh perception of Impressionism's vibrant successor

*The Royal Academy and the National Gallery delight crowds with huge exhibitions of Post-Impressionists and their contemporaries*

*It is late March and we are in the galleries of the Royal Academy of Arts in London. Two schoolgirls in straw boaters, blazers, flannel skirts and knee stockings, with that particular awkward grace of serious female adolescence (of the kind that breaks fathers' hearts), are talking:*

*"You know, I've found the difference between the Post-Impressionists and the Impressionists."*

*"What's that?"*

*"It is that the Post-Impressionists came after the Impressionists."*

*"Oh, I see."*

It is late May and we are in the National Gallery of Art in Washington, D.C., one of the most massive pieces of artillery on the nation's cultural front. And yet it is not at all without resilience. So, several months ago, when the long-awaited showing of various treasures from the Hermitage was canceled suddenly, the Soviets having sent an entirely different display to Afghanistan, another exhibit was decided upon.

J. Carter Brown, the National Gallery's director, went flying off to London, and now there is a very different kind of show installed in Washington.

The show is "Post-Impressionism: Cross-Currents in European and American Painting, 1880-1906," and the English version was a smash hit at the Royal Academy, which sponsored it; so much so that it was extended an additional two weeks in London, to March 30. Between November 17, when it opened there, and its closing, an average of well over 4,000 visitors a day

Private Collection

Giacomo Balla's *The Madwoman,* 1905, combines Social Realism with scientific theories of Pointillism.

shuffled through the stately galleries of Burlington House, the Royal Academy's headquarters, each gladly paying about $4.60. And, if you could tear yourself away from the more than 400 paintings—that is, when you managed to see them at all through the people—what made you feel very good indeed was the plain, pure joy these viewers were feeling in being there, many of the painters of that period having produced pictures which seem to be neurally magnetizing.

There were, in fact, 428 paintings in the Royal Academy show and you could reasonably wonder why some of these were there at all. For Post-Impressionism, in the minds of the academicians and curators who conceived the show, had become something else from what it had been for many years in the eyes of the common beholder.

Alan Bowness, the art historian and head of London's grand Tate Gallery, wrote in the introduction to the catalog that if some paintings in the London show looked Victorian and Edwardian, "this is because Post-Impressionism *is* Victorian painting." Well, of course, Post-Impressionism was something that happened during those years, except that, in France where it was centered, it was hardly known as the age of Victoria and had nothing, in itself, to do with that age.

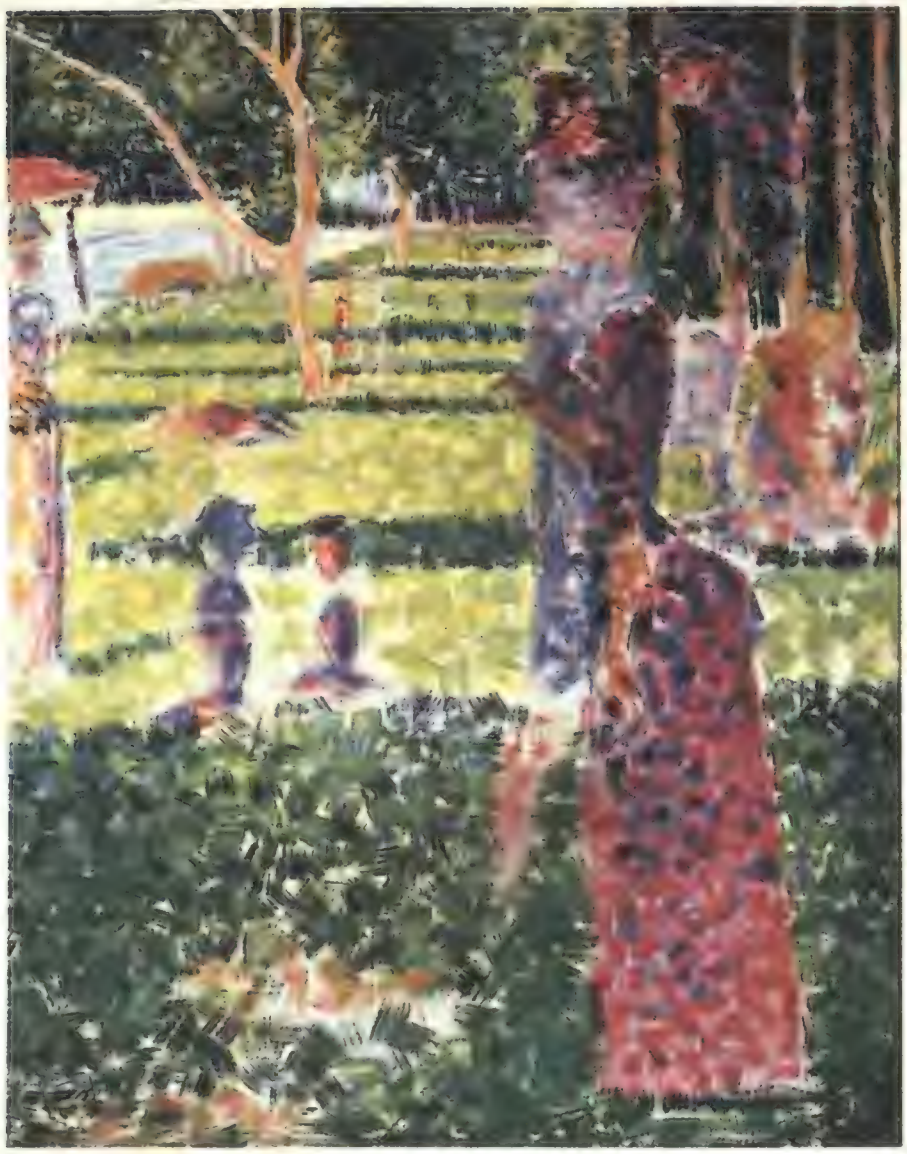
### *An expansive interpretation*

It is not so much a revisionist show as it is one arguably expansive of the conventional idea of what Post-Impressionism is, where it happened and who did it. What the Royal Academy tried to do was to enlarge the geography of the concept to show the European effect of what was being created in France by men we now recognize as giants of the modern era. We are speaking here, of course, of the four monumental artists of the period: Cézanne, Gauguin, van Gogh, Seurat.

It was an ambitious and complex idea and it took two years of hard and scholarly archival work, after two other years of thinking about it, to borrow the paintings for the Royal Academy from 200 museums and collectors and galleries in Europe and North America. The show included works by artists who were from France, Norway, Switzerland, the Low Countries, Italy, Germany, Ireland and Great Britain and were painting between the years 1880 and 1912. (In Washington the cutoff date is 1906, the year in which the grand master Cézanne died.)

"The central core is absolutely Post-Impressionism," said John House, a curator for the Royal Academy show, "but we were trying to widen it out. It is after Impressionism in a cultural sense rather than in a simply chronological sense. The thread of the argument, some have said, is hard work to follow."

Private Collection



Courtauld Institute Galleries, London

A study for his famous *Grande Jatte,* Seurat's *Couple Walking* (left), was completed five years before his meticulous *Young Woman Powdering Herself.*

The exhibit at the National Gallery is considerably different from the original one in London. In order to achieve a sharper focus, the Gallery selected some 200 paintings; a few controversial and downright bad pictures were eliminated, and so were fine ones too fragile to travel—including some shown on these pages. To round out the show, works by American and European artists of the period have been added.

Even so, some will question various works at the National Gallery exhibit. Carter Brown himself said, "And still, I'm sure, people at first blush will ask, 'what is that picture doing here?' But after they have read the explanatory text for the show, I'm hopeful their puzzlement will disappear."

In any event, the National Gallery has made a complex show easier to comprehend through the sensitivity and intelligence of its installation—the characteristic work of Gaillard Ravenel and Mark Leithauser. The paintings are, to be sure, catholic of the period to an extraordinary degree, but they are giving viewers here, as in London, a most provocative, sumptuous and exciting visual experience.

Impressionism was a way of painting nature on the spot, in pure colors, eschewing black—should a shadow get into a picture it would be, perhaps, violet or pink. Its aim was to represent the natural world as closely as possible and it did this with amazing grace.

Post-Impressionism followed Impressionism very quickly and overlapped it often enough. Lines were crossed until the art historians got to work in their way and put them all neatly into precise categories.

The Post-Impressionists took the color discoveries of the Impressionists (this in itself having been a revolutionary triumph, color being to the Impressionists what eyes are to seeing) and used them to express their feelings about things, rather than the things themselves. Here, precisely, was one essence of the difference, to depict not the thing but how you felt about it.

Therefore, and thereafter, many artists looked inward rather than outward. Many painters, such as Cézanne, experimented with the Impressionist discoveries and then moved beyond them.

All of this happened in only 20 years, from 1886 when the Impressionists held their last exhibition (the first had been only 12 years earlier) until the beginnings of Cubism, which is to say Picasso and Braque,

*Bennett Schiff is on the* SMITHSONIAN *Board of Editors. Formerly an art critic, he wrote in February about the restoration of Monet's home at Giverny.*

and Fauvism, which is to say Matisse and Derain, Dufy and Vlaminck.

Enigmatic figures of history capture the popular imagination now and then, and so it happens that a man can't cut his ear off these days without someone or other saying, like a shot, van Gogh. Should the name of Gauguin come up, many will quickly envision, in movie color, a mustachioed figure loping around some island Eden solicitously attended by the beautiful, naive and complaisant women who are the indispensable furniture of such dreams. The stuff of romance is there, at least in the novels and movies that have been made of their lives, which were, often, brutally painful, miserable and tortured and out of which, in glory, came so many blazingly beautiful and exotic paintings.

Van Gogh shot and killed himself after a painting life of only ten years (and these interrupted by attacks of madness), a periodically deranged genius painting the reality of his hallucinations with deliberate, clarifying force: a sunflower with the intensity of a burst atom; a night sky beyond the imagination of astronomers; a café in which "one can ruin oneself, or run mad, or commit a crime."

Gauguin, disease-ridden, dying in isolation, painted to the last, his pitiful belongings sold and his masterpiece paintings auctioned off for pennies by a French colonial bureaucracy collecting debts in Papeete.

Cézanne, working, working, making a mountain into a version of the very anatomy and rhythm of the Earth, died of a chill caught painting on a day he should have remained in his comfortable home. Seu-

Private Collection

Despite the snow, *Christmas Night* by Gauguin was probably painted around 1896 in the South Seas. Figures look Tahitian, but wayside shrine of the Nativity, at right, is characteristically Breton.

National Gallery, London

*In the Park of the Château Noir* typifies late Cézanne, muted, with recurrent linear strokes.

Private Collect

Toulouse-Lautrec's *In Batignolles* is from a series done in 1888, inspired by popular ballads.

rat, who worked himself to death at age 32, put down millions of dots of color, each within a rigorously planned order, consistent and forceful.

It was hardly the movies. And yet, you cannot go to a gallery of their works today without asking yourself —unless you are numb—why this extraordinary lift, why the open, pleasurable response of your neighbors? They managed, these men, along with the Impressionists who preceded them, to have made an age of creativity not seen since the Renaissance.

It may have been, and many have said so, that turbulent times contributed to the flame of creativity: the Second Empire, the Franco-Prussian War of 1870-71, the tortuous beginnings of the Third Republic. It may be that it was the general climate in France, as it had been in the Renaissance years and in the Netherlands for a time, which placed so high a value on artists. Or it may have been their generous friendship for one another. It may have been as simple as that, in the same way that cultivating a seed in a garden until it is magically a flower is simple. So simple you might say it is a mystery. We will settle for that, although it is interesting to read the art historians and critics.

But it is clarifying to put dates on things, and perhaps it was in 1863, at the Salon des Refusés, that modern world painting began.

In that year the Emperor Napoleon III made an appearance at the official Salon (of the Beaux-Arts). He asked to see rejected works and hundreds of canvases were shown to him, stacked against the walls, the unhappiest way paintings can be. The Emperor ordered all the rejects to be shown in another part of the Palais de l'Industrie. In this show Manet, Pissarro and Cézanne were exhibitors.

One of Manet's pictures was the now celebrated, then shocking, *Luncheon on the Grass,* in the foreground a naked woman and two clothed men, *fête à trois,* you might say. The Empress came and pretended not to see. The Emperor changed his mind and that was the first, and the last, of the Refusés shows for a

*A new look at Post-Impressionism*

Von der Heydt Museum, Wuppertal

*Seated Nude Girl with Flowers* painted by German Paula Modersohn-Becker is reminiscent of Gauguin.

American Childe Hassam's delightful *Room of Flowers,* 1894, was done in Impressionist style.

Arthur G. Altschul

decade. There is, sometimes, too much communication between husbands and wives.

Two years later Manet showed his *Olympia* at the Paris Salon, another battle flag, a new preoccupation, in which the artist and his intentions commanded the subject. Olympia was nude, except for a flower (worn in her hair), a black ribbon choker, earrings, a bracelet, a single mule bedroom slipper and a singularly straightforward look. For the young painters who came to look and admire, it was the technique more than the subject that was exciting. The two together were formidable.

For the young artists, dissatisfied with the classicism of Ingres, the romanticism of Delacroix, the gravity of the academicians, the powerful realism of Courbet, and looking for other ways, Manet's pictures were banners of independence. We are speaking of Monet, Degas, Renoir, Sisley, Cézanne, Pissarro. Monet met Pissarro, introduced him to Sisley and Renoir, and the friends became the Impressionists. Their show of 1874 was one of the great events of modern cultural history.

*The artists as critics*

Of course, at the time and for some years, there were great cries of outrage, charges of lunacy, bright displays of show-off invective at dinner parties and in the press. Courbet, not withstanding the attacks he himself suffered, called *Olympia* a playing card.

Cézanne, admitting that Monet had a unique eye for color, insisted that "the eye is not enough; it is necessary to reflect."

Whistler, bankrupted by a libel suit against Ruskin (who criticized him harshly) and who of all people should have known better, was to say of Cézanne: "If a six-year-old child had drawn that on his slate, his mother, if she were a good mother, would have whipped him." Poor Cézanne, poor, honest, dedicated, locked-in Cézanne, clumsy Cézanne, the most deeply blazing genius of them all, was to have his good friend Emile Zola locking away the paintings he had given him so as to save them from the attacks of his visitors. Zola told the great art dealer Vollard (SMITHSONIAN, July 1977), "It pains me so to think of what my friend might have been if he had only tried to direct his imagination and work out his form." Artists themselves, and writers, are not immune from the dopiness which is so often reserved for critics.

When Cézanne arrived in Paris in 1861, Zola found him difficult. "To convince him of anything is like trying to persuade the towers of Notre-Dame to dance a quadrille," he had said. But, of course, that is just what Cézanne succeeded in doing.

What the Post-Impressionists inherited from their predecessors were a heady freedom with which to ex-

Sir John Rothenstein

William Rothenstein, an Englishman, used an unusual mix of chalk and gold paint in *Parting at Morning*.

periment, the considerable armament of a new sense of color, and the realization of feeling and form the results of which are today still being explored by artists everywhere. They made possible not only Cubism and Fauvism, which followed on their heels as swiftly as they had succeeded the Impressionists, but all the movements afterward.

This exhibition at the National Gallery—even after the winnowing out of the London show—is voluminous: a core representation of the French masters, an additional 25 paintings by contemporary Americans and the works of contemporary Europeans. Some of the French artists included are Degas, Denis, Manet, Matisse, Monet, Renoir, Sérusier, Signac, Pissarro, Redon and Vuillard.

From Central and Northern Europe are works by Lovis Corinth, Erich Heckel, Ernst Ludwig Kirchner, Paula Modersohn-Becker, Edvard Munch. British and Irish artists include John Lavery, Walter Richard Sickert and Philip Wilson Steer. Some of the Italians represented are Giuseppe Pellizza da Volpedo, Giacomo Balla and Giovanni Segantini. Among the Dutch and Belgian painters are Jan Toorop, Henry van de Velde, James Ensor, Théo van Rysselberghe. Americans in the show include Mary Cassatt, Whistler, John Singer Sargent, John Twachtman, Thomas Dewing, Ryder, Homer, Eakins and Childe Hassam.

There have been many surprises in both shows, even among the works of the masters. A van Gogh, for instance, *The Novel Reader,* is different from the van Goghs you know (pp. 56-57). The brushwork is smoother, the design simpler. It is done in large flat areas and there is no evidence of his writhing brushwork. The color, however, is incandescent and looking at it for the first time is like having a night-light suddenly switched on inside your head. Here, color is used as pure emotion, not as description.

In London there was a Toulouse-Lautrec, done partly in Impressionistic style, before he went on to his linear narrative descriptions, a fine work which shows he could have gone another way entirely (p. 61).

Among the Europeans, the Italians are especially interesting for their use of the new discoveries to further their intense commitment to realistic, socially oriented painting. One work, *The Fourth Estate,* by Giuseppe Pellizza da Volpedo, an immense painting more than 9-by-17 feet, done in a Pointillist technique and based carefully on the study of optics which had so much to do with the work of Seurat and Signac, seems an undeniable masterpiece.

But it was Paris of a certain period in which it happened and maybe an artist can best describe what that Paris and these painters meant to a young artist. In the introduction to his recently published book, *Chagall by Chagall,* the painter wrote:

"The sun of Art then shone only on Paris, and it seemed to me, and seems to me still, that there is no greater revolution of the eye than the one I encountered in 1910 on my arrival in Paris."

He was 23 then and wrote these words some 70 years later, thinking of Cézanne, Monet, Seurat, Renoir, van Gogh, Matisse.

Overall, considering the shows and the paintings, what seems evident is that people are at their best when they are looking at such art. It is not that they are running away from the daily troubles of everyday life so much as that they are feeling the illuminating effects of aspiration.

Private Collection

*The Dance* by André Derain, 1906, is friezelike, exotic and wildly colored in the Fauvist manner.

In monumental pose of *Young Sailor I,* 1906, Matisse has absorbed Cézanne's use of color to model form.

Private Collection

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Sinhalese gem miner in "mud costume" wades in knee-deep mud surrounding pit mine (background).

*By Akosh Chernush*

# Dazzling jewels from muddy pits enrich Sri Lanka

*Rags-to-riches stories sometimes come true on an island where half-a-million people may be involved in the gem industry*

This treasure trove of garnets, zircons and yellow sapphires is the reward for blind luck and hard work.

In Sri Lanka, anyone who wants to dig in his own backyard needs permission from the government. The temptation to dig is understandable: most of the country is potential gem-bearing land. With gemstones to be found nearly everywhere, Sri Lankans sit on an immense treasure—many with the hope and some with the possibility, rare but real, of getting rich overnight.

Enough rags-to-riches stories go around to make one shake one's head in wonder. People still tell of the discoveries of a 2,967-carat ruby rough and a 42-pound blue sapphire rough. Just six years ago the world's third largest star sapphire surfaced here; cut and polished, it became the 362-carat *Star of Lanka,* pride of the state collection in Colombo. Two years later, in the district of Ratnapura, the prime gemming area in Sri Lanka, a poor farmer gave up tilling his small plot of land to try his luck at mining. In a single season, he found more than $200,000 worth of rough stones, an enormous sum in a country where the annual per capita income averages only $200.

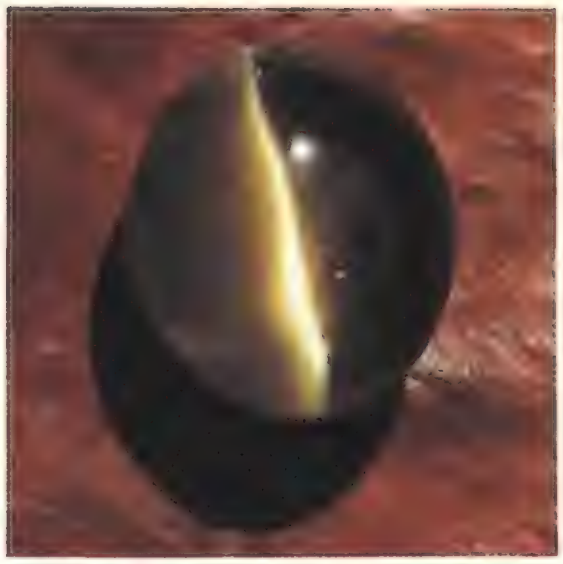
In most cases, success is determined by blind good luck. As an example, Faust Saheed, a leading Colombo dealer, related this story to me: "It's the custom in the countryside to bathe in streams and water holes, and everybody has a favorite scrubbing stone. One day a scout—who spends his life at the mine and claims he can recognize a good gemstone from ten feet—noticed a woman bathing in a stream. She was very attractive and became annoyed when this man came along and started eyeing her from the roadside. Then he approached her and told her that he liked the stone that she was using to scrub herself and hoped to buy it. So the woman thought he was pulling a fast one. But he assured her of his good intentions and asked how much she wanted for it. Well, it took some time before the man could convince her that he was really serious, but finally she sold the stone for 2,000 rupees, about $135. Of course the scout later made about $16,000 on the stone, which was a big blue sapphire. She had not realized that her field where she found her scrubbing stone was full of gems just like it. But since then her land has been prospected several times over, and today she is a light millionaire."

A tropical island about the size of West Virginia, Sri Lanka—formerly known as Ceylon—lies in the Indian Ocean southeast of the subcontinent. In Sanskrit the land was known as Ratnadvipa, the "Island of Gems," and even its shape resembles a rough stone, ready to be cut into a beautiful cabochon. Burma may have better rubies and Brazil more varied tourmalines, but Sri Lanka certainly ranks at the top

*Based in Washington, writer Akosh Chernush and Kay Chernush, a free-lance photographer, have traveled widely—recently in India and Sri Lanka.*

*Photographs by Kay Chernush*

This cluster of sapphires is yellow, but they come in a spectrum of colors.

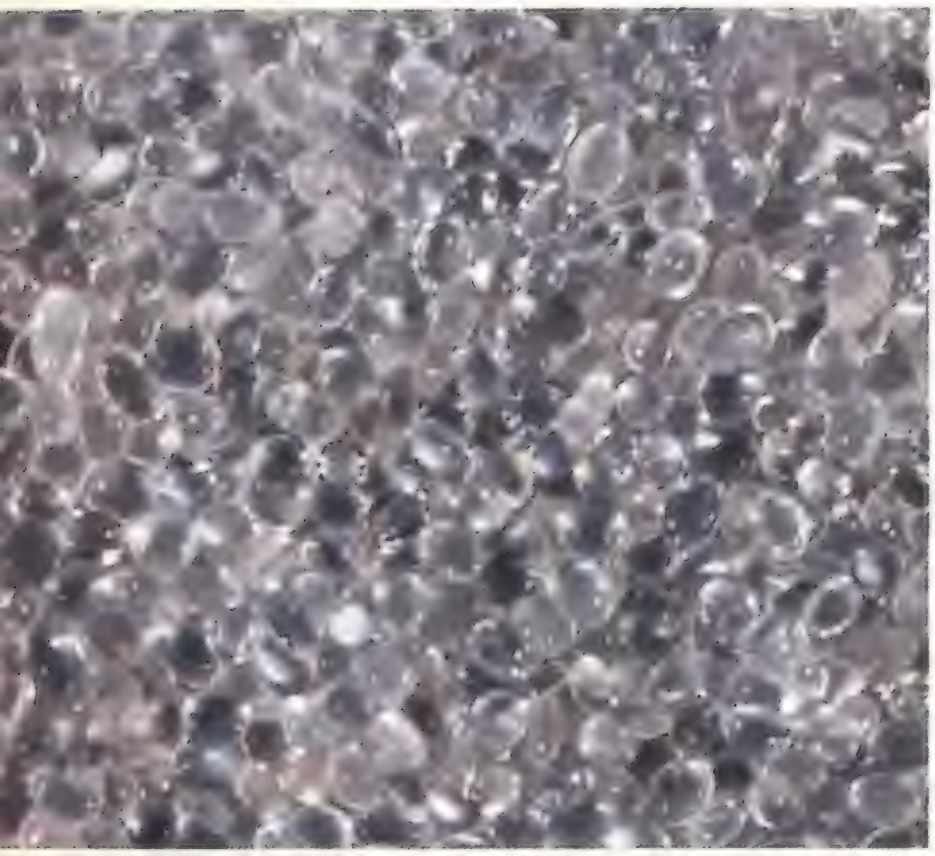


A 54.28 carat flawless cat's-eye could bring some $6,500 per carat.

The six-rayed star sapphire is highly valued—one above is priced at $125,000.

with so many minerals of gem quality concentrated in one area and available in such abundance. The only major ones lacking are diamonds, emeralds, opals and turquoise. "Geologically, 90 percent of our country consists of Precambrian rock," explains T. G. Punchiappuhamy, chairman of the State Gem Corporation in Colombo. "That is the oldest formation, which has gone through the turmoil and molding of millions of years." Constant erosion slowly broke up the rock formations, and swift-moving brooks washed the gravel down the mountains, carrying it to the lowlands where it enriches the alluvial deposits with the gem-bearing layers of gravel that the miners call *illam*.

Some two dozen varieties of gemstones are found on the island. These stones as well as spices were the first tantalizing messages to the Western world from the mysterious Orient. The corundum family, the hardest substance next to diamonds, includes sumptuous, intense rubies, and sapphires of all colors, including the tangerine-colored *padparadsha* and the pomegranate *padmaraga* (p. 71). And of course the blues: according to an ancient Asian myth, the whole Earth rests on this "celestial stone," whose reflection gives the sky its color. Then there is the tense, medium cornflower, the most sought-after in the wide spectrum of blue sapphires, and what a local American lapidary calls "Bromo Seltzer blue." The glorious star sapphire, with its silky white streaks—ideally six—is also highly prized and a source of national pride.

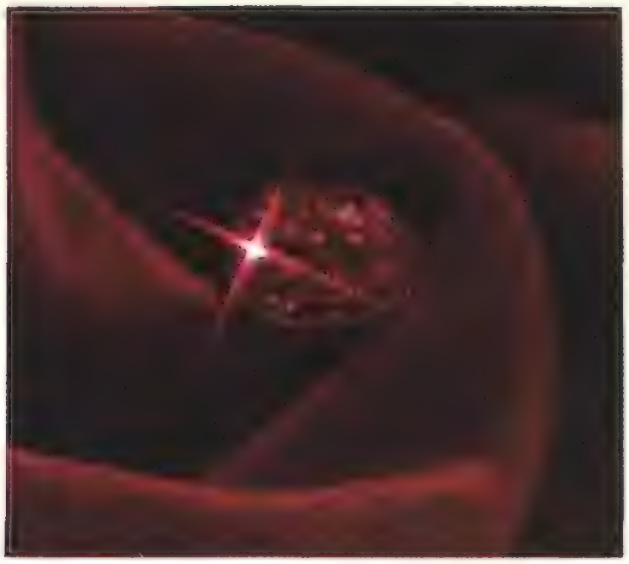


Often mentioned in tales of mystery and romance, once-cheap moonstone has rapidly increased in value.

Another species is the chrysoberyl alexandrite, which is green by day and turns raspberry under artificial light at night. Since the invasion of Japanese buyers in recent years, alexandrite of the highest quality can bring more than $10,000 a carat. The scintillating, iridescent chrysoberyl cat's-eye, worn by the Kings of Kandy to ward off evil, also commands high prices nowadays, depending on size and color, which can range from apple green to dark gray.

There are also blue-violet, golden, pink and colorless beryls, including light and medium-green aquamarines; garnets; lustrous quartzes like citrine and amethyst; a rainbow assortment of spinels, zircons and tourmalines; red and pink topazes; and milky, opalescent moonstones, which are supposed to safeguard the wearer from lunacy.

Today nobody can mine in Sri Lanka, even on his own land, without first obtaining a license from the State Gem Corporation, a governmental agency set up in 1972 to regulate and promote all aspects of the



In Sri Lanka a sapphire like this is called a *padmaraga* for pomegranate color.

Rare *padparadsha* sapphire, found last fall, could bring $200,000 on market.

Group of corundum crystals (1,220 carats) only has value as a specimen piece.

trade, from mining to cutting and from land auctions to exports. Not surprisingly, total control has proved elusive. Illicit mining operations go on by the hundreds, often at night by kerosene lamp. When the police stage a raid, the miners drop everything and run for it, disappearing into the forests and starting over again somewhere else. It would be equally difficult to stop the hundreds of small-time dealers and amateurs who congregate every morning in the main square of Ratnapura to offer their stones to each other, to tourists, to practically anybody who happens by. Even children get into the act, mimicking the way their elders squint and hold up the stones to the light and carrying out their own deals. Up to a certain point, a permissive attitude prevails.

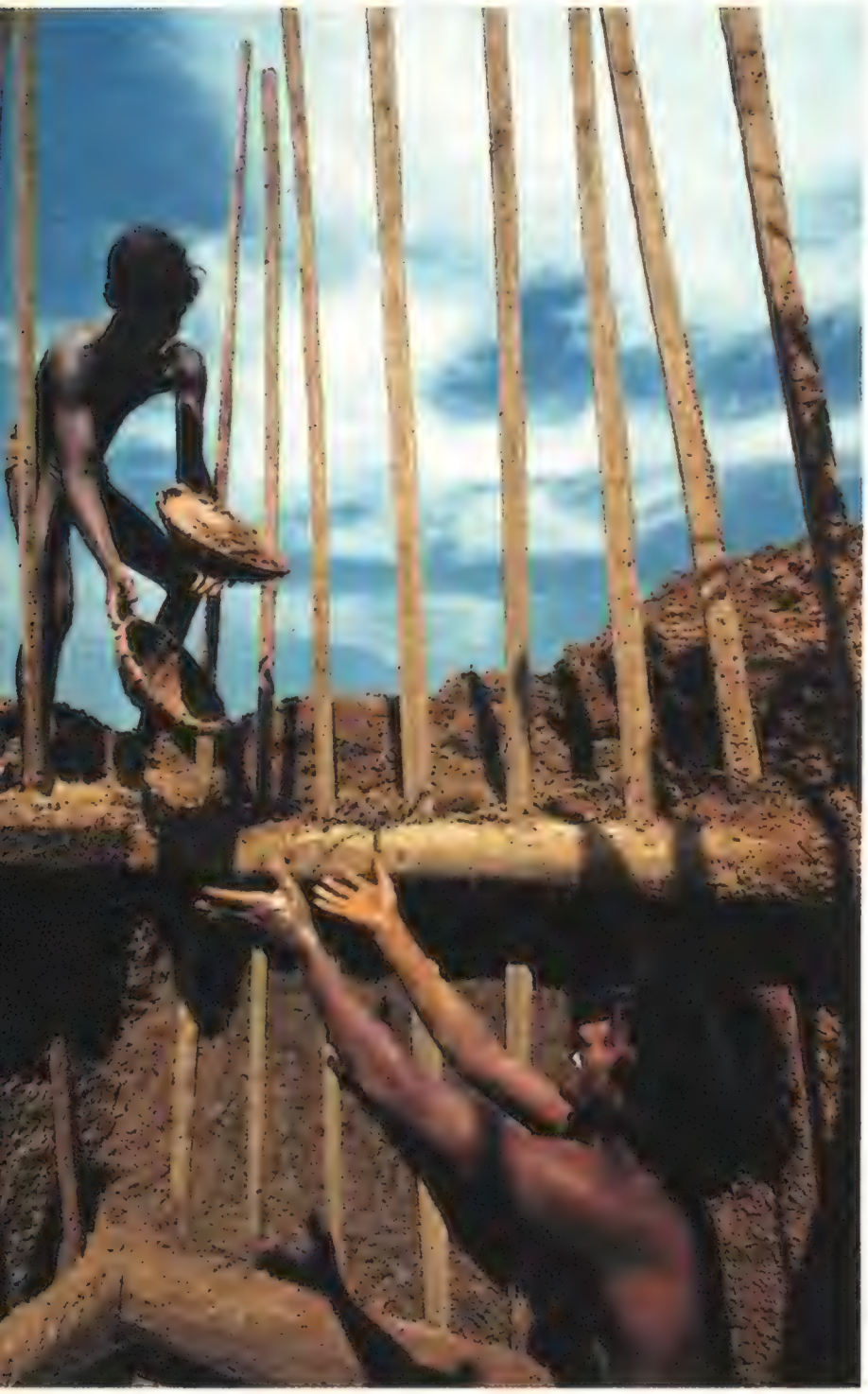
Mining techniques have remained virtually unchanged over the centuries. The only innovation has been the coming of the water pump, which has enabled a few miners to go to depths of 40 feet. Before digging begins, the men stick a 15-foot spike into the ground to find out how deep the gem-bearing *illam* lies. If it is only a few feet, they dig a circular "surface" pit. To reach lower-lying gem gravel, they prepare a rectangular pit that will require timbers. Since the best gemming sites are usually close to brooks and rivers or on marshy ground, it doesn't take long before they reach the subsoil water, which has to be bailed out before digging can continue.

As the pit deepens, the miners build scaffolding inside, placing palm and rubber tree planks around the walls and stuffing the space between the timbers and the earth with leaves to prevent the walls from collapsing. Although the tools are simple—shovel, pick, spade, crowbar—the work is carried out with assembly-line efficiency. In seconds, a young miner fills his basket with soil and throws it up to the fellow next to him, while catching the empty basket thrown back to him (p. 72). As the pit becomes very deep, the rhythms change; then an old-fashioned pulley is rigged up to hoist soil and water in cans to the surface.

Despite the extremely tiring work, the pit area is a lively place, full of excitement and anticipation over what might result from the miners' exertions. Children, relatives and other kibitzers stop by to watch as the work crews wash the surfaced *illam* in their large round baskets, or *watti*. With each swirl of the *watti*, the sand, clay, mud and smaller stones are washed away, leaving only the heavier pebbles. Then it's the turn of the most experienced miner, the sorter, who quickly, but thoroughly, inspects the basket's residue, looking for the special glint and hues of the rough gemstones. "It's a gamble," says pit owner Dan Rajapakse. "You never know. But the fact is there's nearly always something. If not alexandrite and the better stones, at least some garnets and topazes."

At a house outside Ratnapura, two miners, Nirmal Nandasena and Egolda Piyasena, partners and brothers-in-law, showed me their cache of treasures before auctioning them off—the result of six weeks of hard, dirty labor. There were 141 stones, carefully grouped by color and size and wrapped in wax paper: 36 star sapphires, 51 blue sapphires, 17 rubies, 14 light-blue sapphires, 11 yellow sapphires, 5 milky sapphires, 2 cat's-eyes and 5 mixed stones. None was very big, and they were not necessarily of the best quality, but the lot added up to nearly 500 carats. Dealers, cutters and scouts arrived by the dozens and milled around in the front yard, examining the stones. The miners, who for weeks had worn little more than their "mud costumes," showed up for the occasion in holiday sarongs.

As the bidding wound down to a close, many in the crowd drifted off to an auction at Rajapakse's house, tucked away on a rutted country road in a thicket of jungle. For hours the rough stones were passed from



For centuries miners, like these, have tossed baskets, or *watti,* of soil and gravel in search of gemstones.

hand to hand as dealers and lapidaries tried to gauge the potential of each piece, how many carats would be left after cutting and polishing, and what price each might fetch. They breathed on the stones, dipped them in water and perhaps rubbed them in the sweat on their foreheads before they held them up to the light. One particularly fine 55-carat blue sapphire, which Rajapakse's six-man mining crew had found only a few days earlier, went for $30,000. Even those who just stopped by out of curiosity and could not afford to buy were eager to handle the goods.

Dealing in rough stones—buying, cutting and reselling—is a little like playing poker: part experience and part pure luck. "Sometimes you might make a fortune from one stone. Sometimes you lose your entire capital," says Wadood, a young dealer.

### *The profits are divided*

Miners run greater risks, since they can go for weeks without finding anything. But then again some might pocket as much as $20,000 after a month's effort. After the stones are sold, either at auction, in private deals or to the government purchasing center, the profits are divided. The splits vary, but the moneymen ordinarily get half the profits for financing the enterprise, buying the tools and paying the laborers' wages. The man who took out the license and supervised the miners gets a ten percent share. Another 20 percent goes to the landowner or person who holds the lease, while the owner and operator of the pump receives ten percent. The remainder is shared among the miners, who sometimes manage to become investors themselves, rising in the gem hierarchy to organize their own operations.

Despite the risks and laborious work, gemming has become an increasingly competitive business. Gem exports more than doubled during the last five years and now rank fourth, after tea, rubber and coconut. The increased activity has also given a boost to a number of peripheral occupations—the lapidaries, jewelers, basket-weavers, gemologists and above all the bureaucrats, who run the Corporation. "It is very difficult to say who is not in this business today," Mecci Macan Markar, a partner in the oldest firm in the country, notes with a hint of irony. He estimates that probably half-a-million people are involved in some aspect of gem-related activities.

Only one interest seems to be on the decline: Sri Lanka is no longer the smuggler's paradise it once was. Traditionally gems were smuggled out of the country to Hong Kong and Singapore, and no method was considered too outlandish to circumvent high income and export taxes, and the severe currency laws. It is said that those with a friend in the customs packing

house got their stones out in spice and tea packets, while other dealers found it advantageous to sell to high-ranking foreign officials at bargain rates in return for the use of their diplomatic pouches. For a while a local seafood company supplying shellfish to Bangkok restaurants also delivered lobsters stuffed with gemstones. Even the dead were not exempt, since a corpse being sent abroad for burial was not inspected by customs. For a long time the so-called "insurance scheme" would guarantee delivery of any stone to any part of the world for ten percent of its value.

Chairman Punchiappuhamy believes the State Gem Corporation's main success has been, in addition to guaranteeing miners fair prices and opening up the trade among the local population, the drastic reduction in smuggling. Before the Corporation was set up, the total value of legal exports was less than $30,000 a year, while in 1978, private and Corporation exports combined reached nearly $34 million.

When the Corporation was established the private sector was uncertain about the future. Nobody knew what to expect. The government took over Macan Markar's headquarters in downtown Colombo, in exchange for an outlet at the new Intercontinental Hotel. The building was the ultimate symbol of the trade, for a certain amount of history is attached to this 130-year-old family firm. The Macan Markars came from the ancient port city of Galle, where the Moslem population has long been associated with the gem trade. They count kings, queens and the Emperor of Japan among their clients.

"The dealers were actually rather worried about how they would fit into this new organization," recalls Mecci Macan Markar. "The laws and regulations were very strict, but the head of the Corporation gave us plenty of encouragement and incentive. People have made more money *legally*. Otherwise the whole business would have collapsed long ago."

*Mōslem minority sensitivities*

Among some Moslem dealers, one senses an undercurrent of resentment toward the Corporation. This feeling goes to the heart of ethnic sensitivities between Sri Lanka's Sinhalese majority and Moslem minority, which makes up seven percent of the population. "If you go to the State Gem Corporation, you never find a Moslem there," notes a Beruwala merchant, "while everyone knows we pioneered this business. If they had put just ten percent Moslems in the Corporation, it would have been an absolute success."

The Moslems came to Sri Lanka at different intervals from the Middle East, North Africa, Arab-occupied Europe and southern India, driven by adventure, gems and ivory. Settling along the western and southern coasts, they founded the first ports, including Colombo. Their oldest town, Galle, is several times mentioned in the Bible—it was referred to as Tarshish —and hailed for "the multitude of all kind of riches."

Displaying his gem collection proudly, entrepreneur Bhadra Marapana is member of a new breed of traders.

Faust Saheed, who is equally at home in Tokyo or Houston, always returns to Galle during the holy month of Ramadan to distribute the customary alms to the poor.

Saheed is almost a newcomer in this ancient community, for his ancestors did not settle in Galle until 1488, bringing with them the huge key to their house in Spain as if they hadn't quite made up their minds to remain permanently. The old key is still a cherished family heirloom. Sixteen generations of the family were connected with the gem trade. Saheed, a small man with hooded eyes that never give away his thoughts, learned the secrets of the trade from early childhood. "I learned the feel of the stones," he remembers vividly. "After school I worked with our cutters in their workshop. I learned to tell the weight of a stone with the naked eye."

He was in his teens when he made his first "big money," taking a chance on a gold ring with a stone everyone, even the seller, insisted was synthetic. "My instinct told me the stone was genuine. So I paid top price, mainly for the gold, and right away sent it to Germany for testing." The German gemologists proved him right, and he sold the stone for 10,000 rupees, "which is lots of money for a schoolboy." After that, he could never imagine doing anything else, and today, at 34, by his own admission he turns over from two to three million dollars a year.

In dollars there are perhaps 20 gem millionaires, in rupees perhaps thousands—old money and new, none of it very visible except for the early California-style

houses of the Beruwala gem cutters and others who struck it rich prospecting in the north about ten years ago. Rumor has it that some wealthy merchants don't believe in banks and stash their money in desk drawers. But if that is true, there are plenty of others who invest, collect valuables and contribute to charities.

Purandara Sri Bhadra Marapana is one of the new breed of gem traders, if not exactly typical of them. The son of a Sinhalese landowner, he started in the business 20 years ago with $50, hustling rough stones on the streets of Ratnapura. Today he runs a mini-conglomerate that includes a newly opened hotel (which he designed himself), restaurant, gem museum and art gallery, lapidary and jewelry workshops and a retail showroom. He is a true original in the closed and secretive world of the gem trade—expansive, intellectually inclined, more philosopher than dealer, which because of his engaging manner does nothing to hurt sales. "I don't like the business side. My temperament is that of an artist," Marapana insists, launching into a discussion of Picasso's influence on his jewelry designs. Yet watching him welcome tourists, oversee craftsmen and plan the hotel herb garden, all the while inspecting new stones, receiving scouts and brokers, buying and selling, one gets the feeling he is as shrewd as they come.

Of course Sri Lanka's gem trade is more than an amalgam of colorful personalities and spectacular finds. The local merchants are said by outsiders to be the toughest, shrewdest people around, especially for the novice buyer who knows little about gems and cannot bargain in the most sophisticated way or with the necessary perseverance. But more and more people are buying gems in these inflationary times, and the trade has become almost a barometer of the world economy. The investment-minded Swiss spent almost twice as much on gems in 1979 as the year before. Arab oil is buying up big stones, while Thais are making a killing buying cheap milky white sapphires, treating them and turning them into blues. Sales to the Germans declined, but the French bought more. The Japanese, who are the country's number one gem customers, slowed down somewhat during this past year, but they still outbought the Americans seven times over. Nowadays nobody knows better than the Sri Lankans who has money and who doesn't.

Dealers and lapidaries gauge potential of this 55-carat sapphire at auction at Dan Rajapakse's house. Dealers may breathe on it or rub it in sweat to show stone well; this one brought $30,000.

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Fra Filippo Lippi painted two miracles in one: St. Benedict (left) has vision of a boy drowning and

*By Michael Olmert*

# Scholars celebrate 1,500 years of Benedictine vision

*The Saint founded an order and developed a* Rule *for a moderate, contemplative way of life that has enriched us ever since*

National Gallery of Art, Washington

sends St. Maurus to the rescue; full of faith,
Maurus walks on water to pull the boy to safety.

Consider the cuculla, the monk's cowl—a bit of woolen apparel straight from the Middle Ages. It shelters, it protects, it envelops its wearer. It lasts, is practical and is never out of fashion.

But, more important, with its swelling sleeves and hood up, it is a haven from the storms of life. A place to think, to reflect on the blandishments and baubles that the world so quickly gives and quickly takes away.

Like the proverbial monk gaining strength and self-awareness from his meditation in that cowl, so Western civilization has fought off the dangers of the night, the menacing Dark Ages with its Visigoths and Vikings, its pestilence and conflagration, its cold and ignorance. Only, instead of a cowl, civilization sought refuge within monasteries, enclosures where learning, art and grace persevered during the long night of mankind's soul.

Historians now freely concede that, for those thousand years between the fall of Rome in the fifth century and the early Renaissance in the 15th, our spiritual strength and survival was a matter of cowls and cloisters. The skin of our teeth was given resiliency by monasticism.

This year scholars assembled in Washington, D.C., and at Yale University to observe the 1,500th anniversary of the birth of the man who was the father of Western monasticism. That man, now called St. Benedict, was born in the Italian village of Nursia in A.D. 480. And although we now consider him a product of late Antiquity, he was in fact born into a noble family near Rome and thus fell heir to the cultural tradition of the Roman Empire. Rome then was a moribund capital, a final ember desperately trying to burn again with a bright, imperial flame. But faced with certain demise (a crude Goth named Odoacer had replaced the last, feeble Roman emperor in A.D. 476), the city and its people gave vent to the old Roman custom of *carpe diem* ("seize the day!") with a vengeance: riot and discord filled the air.

The young Benedict sought quiet and reflection in the hills 40 miles east of the city, at Subiaco, where he lived in a cave, dressed in animal skins and ate only the barest necessities to keep himself alive. In so doing, he had adopted the life-style of the eastern Mediterranean holy man, the hermit's life of the so-called "desert fathers," who in their turn had been heirs to the martyrs and Biblical prophets, particularly St. John the Baptist and Elijah.

Hermits at times exhibited an exaggerated rivalry as to which of them could accomplish the more dramatic acts of self-denial. A late medieval tale illustrates this competitive spirit. One day, a hermit who had to gather his daily water ration from a distant well moved his hut to a more convenient location. After the move, however, he noticed an angel counting his steps. The hermit's response was swift: he moved again, this time five miles farther *away* from the well.

In the first centuries after Christ, modest groups of such hermits began to band together, probably for mutual protection, and the idea of solitary monks living an eremitical life began to give way to a cenobitic ("living together") one, as Syrian and Coptic monasteries began to grow in size and influence. One early community in Egypt is thought to have supported 5,000 such monks, and even to have built its own fleet

*Author Michael Olmert wrote about the new Corning Museum of Glass in* SMITHSONIAN's *May 1980 issue.*

to protect its far-ranging trade routes and lifelines.

Benedict himself gravitated to a monastery at Vivovaro. His life has been vividly recounted, first in the *Dialogues* (593-594) of Pope St. Gregory the Great, less than 50 years after Benedict's death. Such retellings blossomed in the Italian Renaissance, whose artists—many of them working in local monasteries—often turned to tales from monastic history, illustrating such famous saints as John the Baptist, Anthony, Jerome and Benedict.

In fact, a characteristic act of Benedict's life—his intercession to save a brother monk—was painted as an altarpiece panel by Fra Filippo Lippi (pp. 80-81). It details the saving of young Placidus, who had accidentally fallen in a lake near Monte Cassino (the major monastery founded by Benedict). When Benedict was granted a vision of the drowning boy through divine intervention, he called for another youth, Maurus, blessed him, and dispatched him to the waterside. Filled with the Benedictine confidence and zeal, Maurus so far forgot himself that he walked impetuously over the water's surface until he came to the submerged Placidus, whereupon he pulled him up by the hair and eased him toward shore.

Benedict's battles with the devil also receive much artistic attention. It is said that when Benedict lived in a cave, during his early years at Subiaco, his food was lowered down the cliff face on a rope; a bell attached to the pulley announced each mealtime. When the devil sought to weaken Benedict by breaking the bell, another vision enabled the saint to counter Satan's trick. During the building of Monte Cassino, Benedict's assistants ran to him frustrated by a boulder that refused to budge. When Benedict arrived at the site, he correctly saw what no one else could: an obstructionist devil perched on the rock, which conveniently exploded under the saint's piercing gaze.

Such tales are not merely quaint lore from a bygone era. There is now, and surely has always been, a spiritual and psychological reality underlying the fabulous. We, like Benedict, are able to see whatever we truly want to, and should be so moved to use that sight to improve either ourselves or our world.

For the most part, competition has been good for

Monte Oliveto Maggiore, Italy

Medieval Benedictines (above) and present-day counterparts at St. Anselm's Abbey in Washington take meals in silence. St. Anselm's monks take turns reading aloud chapter from St. Benedict's *Rule*.

civilization. It has made us build better mousetraps, develop better crops, even write better poems. This notion is probably true in every area of human endeavor, save monastic life. It would have made no sense for monks in Ireland and Gaul to compete with the asceticism in food and clothing practiced by the desert fathers of Egypt or Syria.

Benedict saw through this, and set out at once to reform the ideas of monastic life that he inherited. His principal means of doing so was his writing of a short handbook called the *Regula monachorum,* or *Rule for Monks,* known today as the *Rule* of St. Benedict. For the last 15 centuries, groups of monks following the *Rule* have had a chapter of it read to them every day, as they gathered to work or eat (opposite).

If there is one key to this 12,000-word manuscript, it would be moderation. Thus, St. Benedict's monks were to follow a proper diet. He saw that overmuch fasting led only to lethargy, not Godliness. Although they were to avoid the meat of quadrupeds, monks could eat poultry on special feast days. They were to gather for at least two meals a day. They were allowed one pound of bread and one hemina (about one-third liter) of wine each day. As an early commentator put it: "It is better to drink wine with measure than water with hubris."

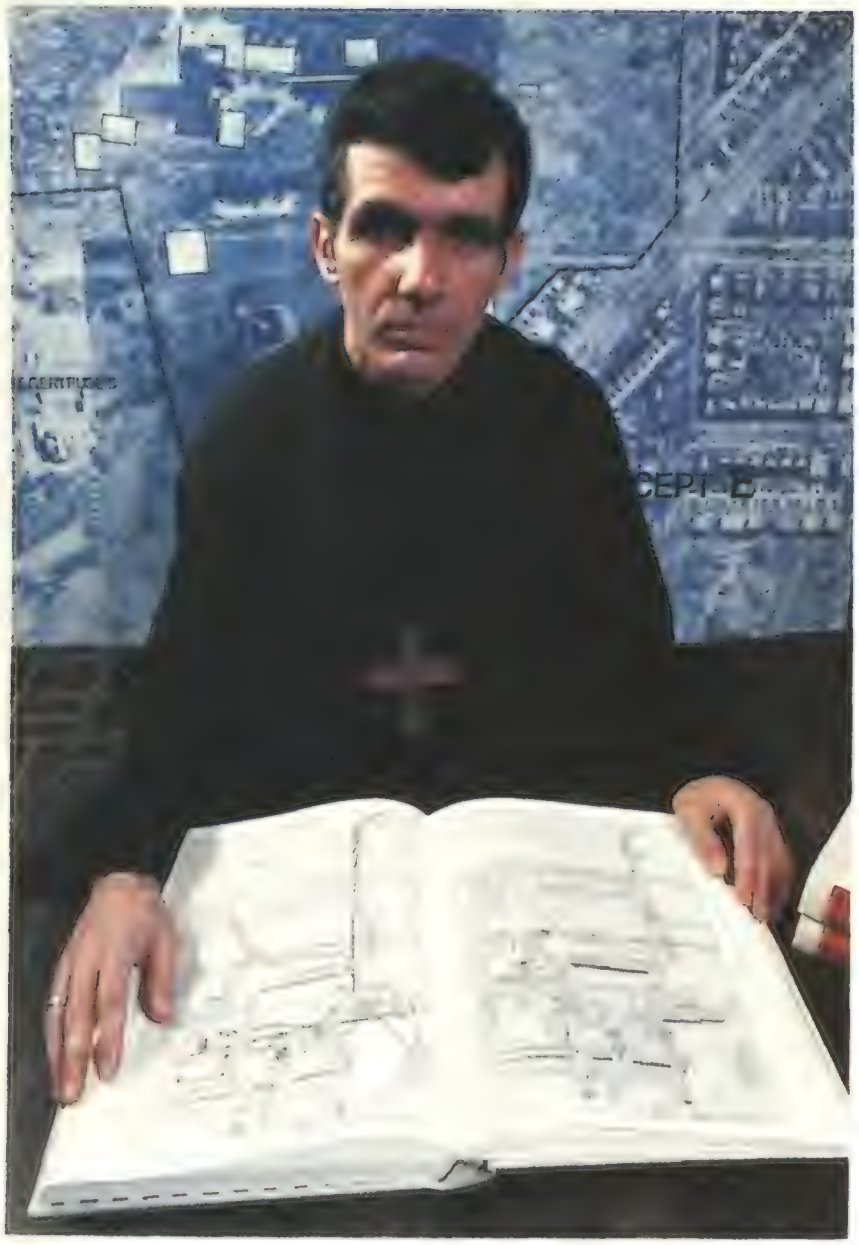
Monks also were expected to wear serviceable clothes and shoes; November 11 soon became the day on which each monk would exchange his old clothes for new, with the old going to the poor. (That date was not selected whimsically; it is the liturgical feast day of St. Martin of Tours, a fourth-century missionary who had given half his cloak to a beggar.) Here, too, were all the precepts needed for integrating individuals into a close-knit community. There were guidelines against murmuring and others that militated against blind obedience: the abbot, an elected head of a monastery and its chief of administration, was encouraged to seek the advice of other monks before making momentous decisions. According to historians of monasticism, such moderation was the primary reason for its universal success.

Another key element in the Benedictine monastic *Rule* was work: "Idleness is the enemy of the soul. Therefore the brethren should be occupied at certain times in manual labor, and again at fixed hours in sacred reading."

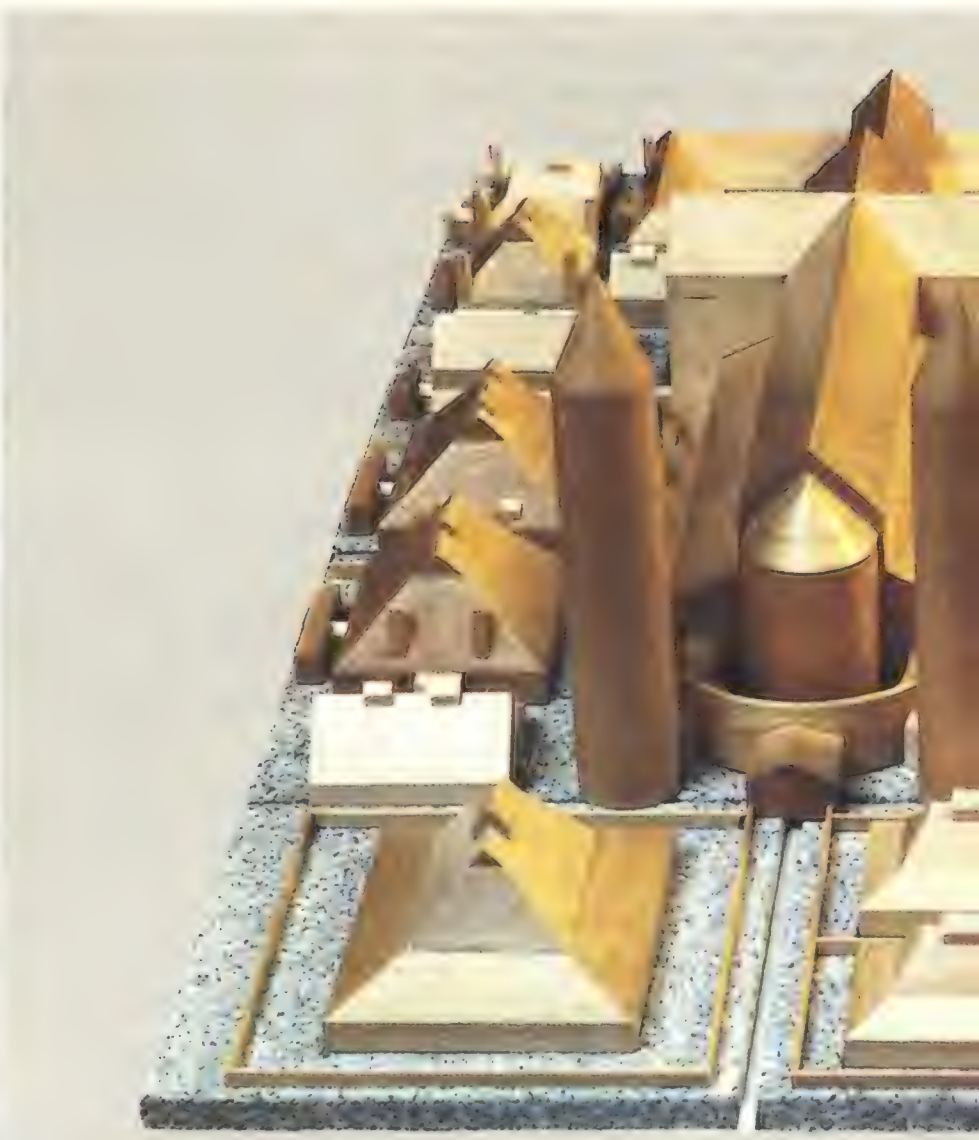
Monks were expected to devote a good portion of each day to reading. To do that, they needed manuscripts. The result was the establishment of a scriptorium, a writing room where all kinds of literature—both secular and divine—were copied for immediate use and for posterity (below).

If the monks had made no contribution other than the copying of manuscripts, we would still be celebrating St. Benedict's sesquimillennium, or 15th centenary, this year. But they did much more. For reasons sacred and profane, monasteries from Byzantium to the Outer Hebrides managed to copy and salvage the corpus of classical literature—both in the sciences and the humanities—until it was "rediscovered" during the Renaissance. They developed the medieval callig-

Dom Mark Sheridan, St. Anselm's Prior, works on new modern English translation of the *Rule*. His labor is reminiscent of that of some medieval monk-scholar working on scriptural commentaries.



St. Anselm's Abbot James Wiseman consults *Plan of St. Gall* as he and monks design new abbey buildings.



If St. Gall abbey had been rebuilt according to the Plan (it never was), it might have resembled

raphy that led to today's modern cursive script and to printing. And they were the most important force behind early medieval art, architecture, urban planning, domestic husbandry, education and the sciences.

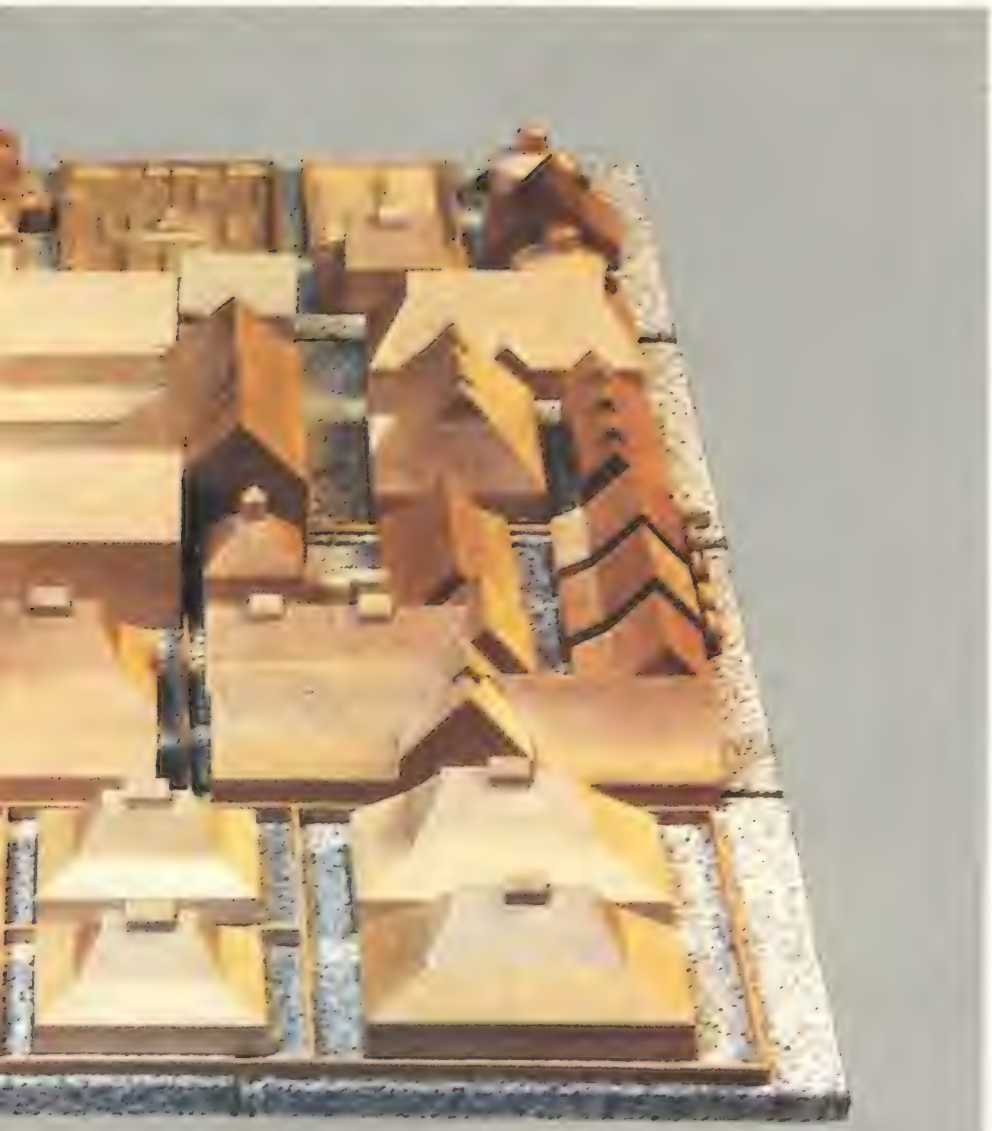
It was in celebration of these great achievements that Yale University and St. Anselm's Abbey organized a two-part symposium on "Monasticism and the Arts" which took place earlier this year. Besides St. Anselm's —a community of some 30 Benedictines—other participants in the Washington area included the National Gallery of Art, Dumbarton Oaks and the Catholic University of America.

Respected scholars from around the world came to New Haven and Washington to attest to monasticism's staying power. Among them were monastic historian Jean Leclercq, O.S.B., of Abbaye St.-Maurice, Clervaux, Luxembourg; art historians Walter Horn of the University of California, Berkeley, and Otto von Simson of the University of Berlin; and literary historian O. B. Hardison jr., director of the Folger Shakespeare Library in the nation's capital.

Others at the symposium spoke of the influence of Benedictine contemplative life on Dante's *Commedia* (1321), of monastic theology on Ghiberti's great bronze door, the "Gates of Paradise," on the east side of the Baptistery in Florence (installed in 1452), and of Benedictine music and stained glass. One speaker even addressed the traditional caricature of monks as fat, jolly men who laugh a great deal and distill liqueurs—the sweet, amber Bénédictine comes instantly to mind!

Also in honor of the sesquimillennium, the University of California Press recently has published a three-volume, 1,062-page, large-format edition of *The Plan of St. Gall,* by Walter Horn and Ernest Born. The original plan was a table-sized architectural scheme that seems to have been a paradigm for countless medieval monasteries. It is named for the former Swiss monastery of St. Gall, where the document has been kept since the ninth century.

Actually, the Plan was drawn up by unknown men around the year 820, at a time when the push to build monasteries throughout the Holy Roman Empire was



this model, which will be in a traveling exhibition. The large building left of center is the church.

at its peak (there were more than 650 in Charlemagne's Kingdom of the Franks alone). The secular rulers of the time saw this expansion as a sensible way to bring profits from wide expanses of unprofitable land. Charlemagne was in favor of such expansion—if the new monks followed the *Rule* of St. Benedict. The Plan of St. Gall appears to have been a physical realization of the *Rule*. According to St. Benedict, the monastery should contain everything within its walls that was necessary for life; too much time outside the walls apparently had an adverse effect on the contemplative life. So it is with the St. Gall Plan. There is, of course, a large basilica, a refectory for meals, and a dormitory. But there are also infirmaries, stables, a scriptorium, library, granary, mill, brewery, bakehouse, kitchen and pantry, separate houses for craftsmen—shoemakers, grinders and metalworkers, curriers (leather workers)—plus hen and geese houses, barns for oxen, swine, goats, sheep and cows, and a special structure for foaling mares.

Although ideal in character, the Plan was meant to standardize and guide monastic buildings—and in fact did so for centuries to come. The Plan would have to be tailored to the vicissitudes of local siting conditions. Doubtless that is the reason none of the surviving monasteries—much changed by later additions and demolitions—remains precisely the same as the model offered by the Plan. Even St. Gall itself, destroyed several times through the centuries, could not be built precisely to specifications because of differing topography. Although there is no monastery that exhibits all the facets of the Plan's modular, rectangular design, many of them show most of these components.

Now 72, the distinguished, white-maned Horn is professor emeritus at the University of California, Berkeley, and still fired by his love for the market and tithe barns of medieval Europe. His research in this area brought him in contact with the work of architect and designer Born, himself a Berkeley professor, in the mid-1950s. Their collaboration led to a commission to furnish architectural drawings for a three-dimensional model of the Plan built for the Council of Europe's Charlemagne exhibition of 1965 in Aachen, Germany. The research that went into the building of the model soon resulted in a manuscript that ran to nearly 3,000 pages. A new model (left) and 42 large panels showing the Plan will be sent around the country and to Europe by the University Art Museum at Berkeley.

The California edition of the Plan was handsomely designed by Born (now 81 years old) and printed under his supervision. For the last two decades, Horn and Born have been living laborious lives, not unlike two latter-day monks of St. Gall, and their work, too, has resulted in a great book, full of a love of learning and a delight in the workings of the world.

*Miraculously, the Plan survived*

The original Plan was drawn on five pieces of vellum, sewn together to form a document 44 inches across. A careful draftsman drew to scale some 40-odd monastic buildings (which would house some 120 monks and 170 serfs) on a building site 640 by 480 feet. The same, or perhaps another, hand annotated the whole, giving the purpose for each structure and other special instructions, such as "AB ORIENTE IN OCCIDENTE-[M] LONGIT[UDO] PED[UM] CC" (from east to west [this nave is] 200 feet [long]") or "Between these columns measure ten feet." Around the circular henhouse runs: "Here is established the care for the chickens and their continuous nourishment."

The fact that we still have the Plan at all is nothing short of a miracle. It survived the notorious attack of Magyar tribesmen who sacked the first St. Gall monastery in 926.

The next attack on the document was actually a

blessing in disguise. An anonymous late 12th-century monk used the back of the Plan to compose a *Life of St. Martin* of Tours. Noticing that he needed more room, he continued his tale on the front of the Plan, from which he was forced to erase the building that would have quartered the knights, vassals and horses of traveling noblemen. The document was then folded and refolded, so its bulk was reduced to the size of a small volume, and placed on a library shelf. It remained there in oblivion until 1461; in 1604 it received a solitary mention. It then submerged again, to be revived by a group of 19th-century German scholars.

Until the work of Horn and Born, however, the Plan had received only fragmentary inspection. Together, the two set out to examine the Plan in its closest detail, with an eye to reconstructing elevation views for the buildings that were drawn only in vertical line projection before. Their 20 years of work have paid off handsomely. Their researches have taken them to architectural sites throughout Europe in search of analogues to the buildings in the Plan; their reconstructions are faithful to both the spirit of the age and the precision of the document. Says Horn: "I was always impressed by the layout of the 40-odd structures that comprise the Plan. For example, the granary, the mills, the bakery, the brewery—all seem to have been located for the maximum efficiency of movement and traffic patterns. And that care for detail is repeated throughout. Nothing has been left to chance."

The nucleus of the Plan, as it is for every monastery, was the church. In the case of St. Gall, it was imposing, and if built as planned would have been one of the largest basilicas in Christendom. On the south side of the east-west running axis of the church was the major feature of monastic architecture: the four-sided courtyard with its covered walkway. This was the traditional cloister, the crucible where those lives of monastic dedication would be tempered—in the dormitory, refectory (eating room), or the calefactory (the warming room), and in long meditative walks. The quadrangles of countless universities and museums hearken back to this monastic original.

A two-story structure on the north side of the church was a vital center of monastic creativity. For here was the scriptorium. The Plan shows seven desks (two scribes to a desk) and seven windows. These open to admit flat northern light, the ideal of every artist since time began and critical to the fine details required by the illuminated manuscript—next to architecture, perhaps the most developed art form we associate with the Middle Ages. Like any art form, however, it was not without its own special pains. Wrote one anonymous scribe in the margin of an eighth-century tract: "Writing is excessive drudgery. It crooks your back, dims your sight, twists your stomach and your sides. Three fingers write, but the whole body labors."

But according to another scribe: "To copy books is better than to ditch the vines: the second serves the belly, but the first the mind."

From today's vantage point, it seems that the entire life of the monastery—especially as seen in the Plan of St. Gall—conspired to serve the mind. Armed with the Plan to fulfill their external need for inner order, the monks were more than a match for the so-called Dark Ages. Kings and kingdoms, empires and emperors might now come and go, but the cloister and its industrious citizens would survive, as do the more than 30,000 men and women who live according to the *Rule* of St. Benedict today.

Dom Jean Leclercq, O.S.B., from Luxembourg, chats with scholar Horn at Yale-St. Anselm's symposium.

Brother Maurus Wolf, 74, senior monk at St. Anselm's, reads in the chapel choir stalls, which he built.

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*By John Pfeiffer*

# Current research casts new light on human origins

*Latest work in the laboratory and field reveals a genetic similarity between Man and apes and suggests that their divergence was recent*

An ancestor of modern primates, the "dawn ape," about size of a house cat, lived 30 million years ago.

Evolution started off on a brand-new tack when creatures still close to the apes crossed a fateful if somewhat fuzzy borderline and became the first "hominids" or members of the human family. Although the record of these transitional primates is extremely scanty, something can be deduced about them from the fossil remains of their descendants, specimens picked out of the gravelly sediments in badland regions of Africa, the likely home continent of the human line. We have a general picture of their appearance, the other wild animals they lived among, even their social organization. What we do not know, as yet, is *when* they appeared on the scene.

And it does make a difference. If the shift from ape to human occurred as long as 15 million years ago, as a number of anthropologists believe, the implication is that we have come a long way and left our animal past well behind us. This jibes nicely with a notion that was rather more popular in 19th-century Manifest Destiny times, namely that evolution and progress are one and the same thing, that Man is by his innermost nature on the ascent, having surpassed beast and subhuman in his inexorable rise to civilized status.

A short time scale, on the other hand, has different implications. Some investigators are convinced the shift came to pass a mere five million years ago, which is not nearly so remote in evolutionary terms. In that case, humans are not as different from other animals as one might like to suppose. The beast might still exist in us as part of our essential nature—and being civilized would demand considerably more than doing what comes naturally.

So here we are, a century after Darwin shocked the Victorians, beginning to explore outer space and still asking the age-old questions: What are we? How human are we? How close to other animals? There is also another, rather more pointed question: Do we really want to know? Many people reject evolution, and for them the notion of a descent from apes is not congenial. In earlier times a disapproving lady commented: "Let us hope that it is not true, but if it is let us pray that it will not become generally known."

The tendency to belittle all prehuman ancestors is deep-seated, perhaps serving as an indirect way of boosting ourselves. Not so long ago, for example, it was fashionable to underrate all early hominids, to view them as clever for their times but socially backward. Now it seems that they managed to evolve a relatively sophisticated life-style millions of years before the coming of *Homo sapiens.*

Apparently the tendency to underrate also applies to contemporary nonhuman primates, notably the chimpanzee. Although chimpanzees have long been recognized as the closest of all living creatures to humans, recent findings suggest that the relationship is a great deal closer than Darwin—and more recent researchers, for that matter—ever bargained for. Chimps make tools, hunt (cooperatively upon occasion), share meat, maintain long-lasting kinship ties

A band of early hominids, *Australopithecus afarensis,* might have looked like this three million years ago.

## *New view of human origins*

and demonstrate some ability—how much is under dispute—with words. Furthermore, their genetic makeup is unexpectedly similar to ours: nearly 99 percent of the DNA in chimpanzees and humans is identical (p. 98). It turns out that apes are not quite so different from us, after all.

A new way of thinking about human origins appeared in 1967, a time when things were relatively quiet on the evolutionary front and most theories favored remote origins, the general consensus being that hominids arose about 15 million years ago. When Vincent Sarich and Allan Wilson of the University of California, Berkeley, suggested a beginning some ten million years more recent, they not only challenged a prevailing dogma, but they were not even playing the same research game. Instead of going fossil hunting in Africa and discussing canine-tooth lengths, pelvic structures and cranial capacities, they worked in a biochemical laboratory and concerned themselves with such abstruse things as species-specific compounds and immunological distances.

Their approach involved the fact that the closer two species are related, the closer the composition of their blood proteins. To measure the degree of similarity, they mixed albumin proteins from the blood of various primates with antibodies made in rabbits by injecting them with human albumin. The stronger the reaction, the closer the relation. There was only an 80-percent reaction with albumin from monkeys, no surprise considering the appreciable evolutionary gap between us and our simian cohorts. The antibody reaction against the albumins of the Asian apes (the gibbon and orangutan) was 88 and 92 percent respectively. But the albumins of the African apes (the chimpanzee and gorilla) produced by far the strongest effects, a 96-percent reaction (opposite). Indeed, from a biochemical standpoint, the chimp and gorilla are closer to us than to their Asian cousins.

All of which did not clash unduly with established ideas, and has since been amply confirmed by many investigators, notably Morris Goodman at Wayne State University. Sarich and Wilson went one step further, however, hypothesizing that primate proteins, including albumin, change at a steady rate during the course of evolution. By measuring the distance between African apes and humans, and estimating how fast their proteins were evolving, Sarich and Wilson concluded that "the time of divergence of Man from the African apes is . . . 5 million years." This was too much, too close for comfort, as far as most fossil experts were concerned. They gave little weight to the conclusions of the two young investigators who applied a new, unfamiliar and, in their opinion, untested "protein clock" to dispute an established time scale. The question is how fast molecular evolution proceeds, and whether it advances at a steady rate or occurs in spurts.

## *Fossils from 400 hominids*

Important evidence about the age of hominids had been accumulating ever since 1959, an auspicious date in the study of human beginnings. It marked the 100th anniversary of Darwin's *On the Origin of Species,* and the year of a major discovery in the Olduvai Gorge in Tanzania. After devoting nearly three decades to the search for traces of human ancestors, Mary and Louis S. B. Leakey finally came up with parts of a massive skull, a 1.8 million-year-old fossil popularly known as "nutcracker man" because of its huge jaws and molar teeth, and technically a member of the genus *Australopithecus,* the earliest fossil hominid.

The find made headlines, and ample financial support soon followed the publicity. The search went into high gear, not only for the Leakeys, who did more than twice as much digging in a single year than they had in all their previous Olduvai seasons, but also for their colleagues throughout the world. Fossil-rich regions of Ethiopia attracted two large-scale expeditions, one organized by F. Clark Howell of the University of California, Berkeley, and Yves Coppens of the Musée de l'Homme in Paris (SMITHSONIAN, May 1970), the other by Donald Johanson of the Cleveland Museum of Natural History and Maurice Taieb of France's Centre National de la Recherche Scientifique. Richard Leakey, who had taken his father's place as head of the National Museums of Kenya, led an international team into the deserts around Lake Turkana

*John Pfeiffer, whose books include* The Emergence of Man, *wrote in the February* SMITHSONIAN *on the rise and decline of Monte Albán in Mexico.*

Vincent Sarich checks the results of an experiment that measures the degree of similarity between the blood proteins of humans and chimpanzees. The difference works out to be only about four percent.

(formerly Lake Rudolf). The collective yield to date includes thousands of fragments representing 400 to 450 individual australopithecines and other hominids.

The latest synthesis, the gist of up-to-date thinking about our origins, is embodied in a brand-new species recently christened *Australopithecus afarensis* by Johanson and Tim White of the University of California, Berkeley. The term *afarensis* refers to Ethiopia's Afar Triangle west of the southern tip of the Red Sea, a churned-up region of cliffs more than two miles high, flat-topped volcanic craters and temperatures soaring to more than 130 degrees F. There the Earth is splitting at the seams in wide-open fissures, and there Johanson and his associates found abundant *afarensis* fossils. Mary Leakey's team of fossil hunters has found similar remains at Laetoli, a site not far from the Olduvai Gorge.

The newly identified hominids lived from four to three million years ago. They were a strange breed, like nothing in our experience, nothing on Earth today, a surrealistic mixture of apelike, human and in-between features. They walked tall, not slouched or stooped over or shuffling along as once believed, but upright with a 100-percent human stride. The first two *afarensis* bones found in the Afar region by Johanson seven years ago, parts of a knee joint exposed in a dry gully, suggested an erect posture, and specimens collected since then support this conclusion.

Johanson and his team next found a "paleograveyard" on a steep hillside in Afar country: an unprecedented assemblage of at least 13 individuals, nine adults and four juveniles, killed en masse ages ago as the result of a natural catastrophe, perhaps trapped in quicksand or a flash flood. One small area of the site yielded more than a dozen bones from the same foot which, together with remains from other locations, indicate a robust but otherwise fully human foot, complete with a well-developed arch and big toe pointing

In the Hadar region of Ethiopia, workmen bag gravel that will be washed, screened for additional fossil

straight ahead rather than sideways as with the apes.

Owing to a near-miracle of preservation and virtuoso archaeological recovery, we may even know a place where *afarensis* walked (pp. 99-101). Walking upright thus has an ancient and honorable pedigree. But from there on, so far as human affinities are concerned, it is downhill all the way for *afarensis*.

When it comes to the brain, the most human thing about human beings, *afarensis* appears to be far closer to the apes. Take Lucy, for instance, Johanson's name for a female who died at about the age of 20. More than 40 percent of her skeleton has been found. Small even for her kind, she stood between three and a half and four feet tall and weighed 55 pounds at the most. According to careful measurements by Ralph Holloway of Columbia University, one of the largest *afarensis* individuals, an adult male, had a cranial capacity of some 500 cc, although Lucy's brain was considerably smaller. That puts *afarensis* well within the chimpanzee range of about 300 to 500 cc.

Viewed from afar, Lucy and her fellow australopithecines would have appeared quite human. If you saw a group approaching from a distance of a hundred yards or so, you might easily be fooled by the familiar striding gait and expect individuals human in other respects as well. A close encounter, however, would be disenchanting. It would bring a shock of surprise at the sight of small-headed, muzzle-faced primates looking more like chimpanzees than people (p. 90).

This scenario presents an apish *afarensis* distinguished from other apes mainly by the way it walked. But there is more to the story than that. Further insights are based on studies of the behavior of living primates. Appearances can be deceptive and, although *afarensis* may not have been much to look at, evidence reported during the past year suggests a rather more complimentary picture. It involves a journey back into remote pre-*afarensis* times, events under way some 30 million years ago, and a closer look at the basic forces that gave rise to human populations.

The world's most advanced primate in those days was a cat-sized species with a brain no larger than a Ping-Pong ball, but larger in proportion to its body weight than any of its mammalian contemporaries. In a recent announcement of new fossil finds in windswept badland regions southwest of Cairo, Elwyn Simons and Richard Kay of Duke University and John Fleagle of the State University of New York at Stony Brook called it the "dawn ape" (p. 91). A clue to its social behavior comes from specimens of canine teeth, which are small in the female and large among males, serving the latter mainly for threatening one another in competition for females and for defense.

From here on it was a riches-to-rags record for the apes. During the next 15 million years they multiplied and spread throughout the Old World, the primeval

remains of *A. afarensis*. After a skeleton was found in 1974, 50 square meters were sifted for fragments.

Side views of skulls show small brain size of *A. afarensis*, center. Human is at left, chimp at right.

Here the palates and upper teeth of the same three primate species are presented in the same order.

primate heartland that dominated the surface of the planet in a belt of almost continuous tropical and subtropical forest thousands of miles wide. Then, because of changes in the flow of frigid South Pole ocean currents which resulted in the buildup of the Antarctic ice sheet, climates became cooler and drier, and forests and apes started dwindling simultaneously. Today's apes, like today's forests, are vanishing relic populations, surviving descendants of those standpat species that stayed in their native environments.

Other ape groups followed an offbeat, more difficult course, adapting to the new state of affairs. They are no longer among us, at least not in readily recognizable form, because they eventually evolved into human beings. They were generalists rather than specialists, living in the forest at first, but also venturing out and exploiting food resources in the wide open spaces, in the woodlands and in grassy savannas which were replacing vast stretches of forest.

What happened next is considered in an important new theory, the first to depart significantly from some of Darwin's notions. Owen Lovejoy of Kent State University believes that the pioneer species were playing a dangerous game, and for a time it looked as if they would never make it. A long-term trend in primate and pre-primate evolution has been toward more space between births, longer periods of infant dependency and older ages for sexual maturity.

The trouble with such a reproductive strategy is that it puts a high premium on infant survival, and death rates are a serious problem even in relatively safe and abundant forests. Among present-day chimpanzees, many infants die before reaching the end of their first year, largely because mothers must range widely to obtain sufficient food, carrying their helpless infants most of the time and subjecting them to risk of accident, disease and predation. Life must have been even more hazardous when mothers began ex-

ploiting open country as well as forests, and traveling even greater distances in their quest for food.

"The apes had a real problem," Lovejoy explains. "So they did what mammals often do when offspring survival becomes critical. They started to call on the services of troop members who were unemployed when it comes to child rearing—namely, the males. For most primates, no one knows who the father is and no one cares. Mother does all the work. But in the pinch, selection favors direct participation of the male, thus doubling the number of actively involved parents for each offspring."

As things developed, everyone came out ahead. Father gained a measure of assurance concerning the paternity of mother's offspring. In order not to compete for food with her, he tended to go farther afield and do more and more of the long-distance foraging, which, of course, meant less moving about for her and, for the young, more attention and a safer upbringing. Strife within the group declined as males competed less violently and less frequently for receptive females, a change reflected anatomically in smaller canine teeth. Walking upright evolved not as Darwin thought —in the process of freeing the hands for tool making and tool use (tools became important much later)— but to carry food back to home base for sharing with the family, a factor previously stressed by Richard Lee of the University of Toronto.

Monogamy and everything that went with it seem to have been established by *afarensis* times. In fact, if the strength of the male-female bond is any index, and if Lovejoy's theory holds up, modern humans could be said to represent devolution rather than evolution in at least that respect. Survival depended on a close-knit male-female relationship to an extent that no longer applies. In a strictly biological way, the until-death-do-us-part notion made a lot more sense when hominids were in the minority and struggling to survive than it does today, now that we have become, for better or worse, the planet's dominant species and survival may depend on achieving zero population growth.

According to Johanson and White, the *afarensis* breed split into two major branches starting perhaps three million years ago. There was a "brawn" line which became extinct within the past million years, and a "brain" line which still manages to hang in there, with us as sole remaining representatives. Brawnliners included a sequence of robust australopithecine species equipped with increasingly powerful chewing mechanisms. Like gorillas, they often developed a special bony ridge running along the top of the skull from front to back, a crest designed to provide an anchoring platform for massive jaw muscles. The teeth were formidable tools, pulverizers featuring supermolars as much as twice the size of ours, each with a grinding surface about as big as a postage stamp. We do not know why they vanished; perhaps they were simply outclassed, outcompeted, by their cleverer contemporaries.

### *Larger brains and fancier tools*

The brainliners also went in for tools, but not simply the anatomical kind, built-in inherited items like giant teeth and heavy jaws. They relied more on artifacts, on stones deliberately worked to attain cutting-bashing edges, a first tiny step toward what would become a major reshaping of the environment. The oldest known stone tools date back two or more million years, about the time of the coming of the hominids with brains more than half again as large as the *afarensis* variety, the first species to be officially admitted into the exclusive genus *Homo* club. They are known by specimens like the 1470 skull (its collection number), Richard Leakey's highly publicized find in the East Rudolf region of Kenya.

*Homo erectus,* who appeared about half a million years later, is distinguished for a number of reasons. Representatives of this species had brains of some 800 to 1,300 cc, within the range of modern brains (1,000 to 2,000 cc, with an average of 1,400). We know very little about the way they lived, but it involved something new, perhaps something to do with creating rules and a new kind of social order, a possibility suggested by their tool kits. Earlier tool kits consisted of items produced solely to obtain sharp edges; no effort went into further shaping. *Erectus* individuals made carefully worked almond- and pear-shaped hand axes, the first symmetrical tools. Incidentally, they may also have been the first hominids to break out of Africa and forage in Eurasia.

## Man and other primates

Skeletal figures below portray three of the upright primates that lived before Man. The "modern" man gives the scale. *Homo sapiens* remains genetically closely related to some present-day members of certain other primate lines, pictured across opposite page.

Australopithecus afarensis

Australopithecus africanus

Homo erectus

Homo sapiens (Man)

*Fold out* →

News of later developments comes from a recent study of a fossil specimen found in the village of Petralona in eastern Greece. A farmer on the lookout for new water sources heard rushing sounds underground on a local hillside and thought he had located a spring. It turned out to be wind rather than water—air rushing through the galleries of a deep cave. Later explorations revealed a skull imbedded in the wall of an almost inaccessible chamber, and Clark Howell, who has completed an analysis of the specimen with Christopher Stringer of the British Museum (Natural History), identifies it as "definitely *Homo sapiens,* perhaps 500,000 years old," making it the earliest trace of our immediate ancestors, in this case Neanderthal man.

So much for some of the latest advances in research on primate evolution. Looking backward through the ages to the very beginning, we still confront the old unanswered questions of what makes the hominid line unique, where to draw that elusive line between ape and human. And a final decision has yet to be made between long and

Man
African apes
Orangutan
Gibbon
Old World monkeys
New World monkeys
0
10
20
30
40
Millions of years ago
A new time scale
If this time scale, based on the work of anthropologist Vincent Sarich, is true, the human line branched off from the African apes only about five million years ago.
Primitive ancestors
Genetic difference
Reading down this scale gives the "distance" by which the DNA of various lines are separated. Thus the Man-ape split (top left) shows a distance of one percent, while Man and the New World monkeys (split at bottom) are now about eight percent apart.
0
1
2
3
4
5
6
7
8
Percentage of DNA difference

short time scales. Some investigators believe that the first hominids were early members of a widespread genus known as *Ramapithecus,* featuring a rugged lower jaw, large molar and premolar teeth with extra-thick enamel layers, and small canines, suggesting that they may have been exploiting tough woodland and savanna foods 15 million years ago.

The current trend, however, is toward the short time scale. According to Johanson, "*Afarensis* is so primitive in its teeth and jaws and skull that it suggests the possibility of a relatively recent divergence between apes and hominids." Sarich, going by accumulating biochemical evidence, would not be surprised if the common ancestor of the two lines existed as recently as five million years ago—or even a little less—as he and Wilson had said in their original paper.

Evidence continues to come from molecular biology as well as morphology. Comparisons of human, chimpanzee and gorilla DNA show that the species share nearly 99 percent of their hereditary material, or, to put it an-

*Article continues on p. 102*

Above and left: John Reader, © National Geographic Society

## Did this trail lead to Man?

The central lines of footprints shown above, heading north near Laetoli in Tanzania, were made 3.6 to 3.8 million years ago by three short but definitely upright hominids (tracks on the right belong to a prehistoric horse). The shortest individual walked to the left of the others, the smaller of which apparently stepped in the tracks of the larger (left).

Uncovered by a team under the direction of Dr. Mary Leakey, they were discovered in 1978 when Paul Abell, while excavating some rhinoceros tracks, noticed a single, hominidlike heel impression. The rest of the trail lay buried under volcanic ash deposits that had to be removed fleck by fleck with specially designed tools, knives, dental picks and paintbrushes.

The trail consists of 70 footprints representing three individuals, one an estimated four feet, nine inches tall, another slightly shorter, and a third measuring four feet, one inch. No one knows if they were together or whether the tracks were made at different times. No one knows where they were coming from, because whatever remains of the southernmost of the trail (bottom of picture) will not be excavated for some years. Where they went will always be a mystery because the north portion of the trail ends abruptly at the edge of a canyon.

According to Mary Leakey, whoever made the tracks was heading across a grassy savanna during a light shower, perhaps in late September or early October at the beginning of the rainy season. The ground was just damp enough to hold the pattern of their footprints. The sun came out and, in the words of team member Tim White, baked the footprints "hard as a concrete freeway." Then ash, falling gently from an active volcano to the east, covered the trail. The footprints may have been made on a mass migration, because the excavated surface also includes the tracks of elephants, rhinoceroses, giraffes, hares and ostriches.

other way, nearly 99 percent of the genes in a chimpanzee ovum are identical to the genes in an ovum that will develop into a human infant. The relationship is surprisingly close, so close that a number of investigators are debating the inevitable question: would the crossing of a human with a chimpanzee produce viable offspring?

All things considered, the answer is "probably not." But you never can tell. There have been successful horse-zebra, lion-tiger and baboon-macaque hybrids, and the genetic distance between us and chimpanzees is no greater. Furthermore, the first successful hybrid ape—called a "siabon" (right), the offspring of two gibbon species of "marked chromosomal disparity"—was reported last summer by scientists at Georgia State University and Emory University School of Medicine. On the other hand, although chimpanzee and human are close genetically, they are much further apart morphologically, that is, in physical features such as pelvic structure, arm length, brain size and so on. So a good guess is that fertilization might indeed take place, but the odds are that the fetus would abort at about the third or fourth month.

The outcome could be more successful in a cross with *afarensis*, a statement difficult to put to the test since the breed is so long extinct. Something analogous has been accomplished, however, in a work of fiction. In 1953, a French novelist using the pseudonym Vercors published a tale called *You Shall Know Them* in the hardcover edition, and in paperback *The Murder of the Missing Link*. The plot involves a British scientific expedition which came across a relic population of early-type hominids living in a stretch of New Guinea highland jungle. Definitely transitional creatures, they were hairy and had flattened faces and low foreheads; they also walked erect, made stone tools and communicated with one another in a primitive language made up of about 100 "articulate cries." A journalist had himself legally married to a female of the species and artificially inseminated her, producing a healthy apelike male infant, which proved the point of viable hybrids.

But the plot thickened. To foil a business syndicate planning to breed and sell the hominids as cheap labor, the journalist killed his newborn offspring with an injection of strychnine. If the infant were declared human, he would be a murderer, but the syndicate would be frustrated. Declaring the infant an ape would clear him, of course, but give the syndicate free sailing with its forced-labor scheme.

The final word came at the parliamentary level. A special committee of inquiry officially announced that the hominids were human, resting its case on the observation that they regularly practiced a form of fire worship and this showed "signs of a spirit of religion." (The journalist got off on a technicality, and his act saved the rest of the race.)

In other words, there is nothing biologically absolute about being human. It depends in the last analysis on whatever clearly defined forms of behavior are selected as decisive. Technologically and in many other ways, *Homo sapiens* ranks supreme. Socially, the species may leave some room for debate.

Schon-Schon, the hybrid gibbon-siamang known as a siabon, is kept at Georgia State University.

These fossil bones are 40 percent of the skeleton of a three-million-year-old hominid now known as Lucy. The pelvis reveals her sex, while characteristics of the thigh bone indicate that she walked upright.

Environmental activist Jim Scherer:

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*The Lackawanna Plant's Water Control Station No. 9 houses the controls and pumps for the blast furnace gas washer water recirculation system. Placed "on stream" in late 1979, the project cost $4 million. Water is recirculated through the system's 30-in.-diameter pipes and five large tanks at a rate of about 7500 gallons a minute.*

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Decisive move in the simulator "game" of running a reactor is initiating shutdown with scram switch—so called since Manhattan Project scientists planned to insert control rods and "scram" in emergency.

*By Eliot Marshall*

# Matching wits with a nuclear reactor

*Using simulators, future nuclear plant operators can experience unlikely accidents and make mistakes without meltdowns*

No one would expect to pay $6 million to buy a game, but that is a low price today for one of the extremely complex devices assembled at a factory in Silver Spring, Maryland, which in the best sense of the word are playthings of the nuclear age.

Called simulators, they are exact copies of the control rooms that serve as the brains of some of the 72 operable nuclear power plants in the United States. An operator working the thousands of switches on one of these behemoths (pp.110,112) feels that he is actually in command of the most awesome furnace ever invented: the atomic reactor.

Like someone playing on an electronic chessboard, the professional nuclear operator who plays on this machine is matching his wits against a computer. The purpose of the game is to allow an inexperienced

*Photographs by Richard Howard*

trainee to become acquainted with the logic and behavior of the billion-dollar plant that he may have to help run one day. The impulses and quirks of a real plant are stored in the computer in the form of mathematical equations. The simulator "talks" to the operator-trainee through the lights and meters on the control panel. The trainee learns what it is like to be in the brain of a nuclear generating system, and he gets the chance to make mistakes. This is the genius of the simulator: it allows one to learn by trial and error when real errors might be disastrous.

Today's high technology is intolerant of mistakes. The person at the controls of a 747 jumbo jetliner or a nuclear reactor cannot afford to learn by trial and error; in fact, the designers have gone to great lengths to make it impossible for pilots and their like to defeat the safe behavior that has been engineered into these machines. The irony is that while this approach increases one's faith in the machinery, it reduces one's faith in the human controller, because he is made into a bystander of sorts. Human intelligence is needed only to start and monitor the equipment, and to take over in an exceedingly rare emergency. Pilots and reactor operators rarely have a chance to make real mistakes or learn what a real emergency is like.

"Annunciation lights" on alarm panel of control room simulator alert an operator to changing conditions.

Joe Johnson, the chief of the nuclear training branch at one of the nation's largest nuclear complexes, run by the Tennessee Valley Authority, says that his simulators have about 140 different types of accidents (pipe breaks, stuck valves) programmed into their computers. People in his training program get to live through a variety of mishaps they will probably never experience any other way. Johnson is a firm believer in the value of simulators. He thinks that one of the principal effects of the accident at Three Mile Island has been to defeat the objection, often made in the past, that simulators cost too much to buy. Now, measured against the cost of repairing the crippled reactor at Three Mile Island (about $400 million), the price of a good preventive education looks small.

### *Replaying Three Mile Island*

The commercial airline industry "grew up with simulators," Johnson says, but the nuclear industry had no such tradition. An airline would not consider buying a new type of aircraft without having a simulator to go with it, according to Johnson. But many nuclear plants do not own a simulator. All this may be changing. Johnson predicts that within five years simulators will be integral to nuclear plants.

As the sophistication of computers grows, more complicated mishaps are being programmed for operators to unravel and deal with. For example, within weeks of the Three Mile Island accident, simulators were being made to act out aspects of "the bubble," the problem of steam in the coolant system which kept coolant water from circulating properly. That was an utterly unexpected problem, caused by a combination of ordinary but unlikely mistakes, and it kept control-room operators baffled for several days while hundreds of reporters gathered to watch.

Thanks to simulators, every operator in the country who runs equipment like that used at Three Mile Island can have a chance to play with a bubble. The events in that accident have been put into computer language so that anyone may live through those desperate moments of March 1979, just as the real operators did.

Despite their value as training tools, simulators until recently have been regarded as something of a

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Link power plant simulator that will train crews for Seabrook (New Hampshire) plant also helps engineers to eliminate bugs in the "man-machine interface"—communications between operators and instruments.

luxury item. All reactor operators spend some time in training on one of these machines. But only a small percentage of them get to practice on a machine that is a true duplicate of the control room where they will work. Each control room is different, but not every utility wants to pay to have its system duplicated in a simulator, so companies without simulators take turns using other people's training centers.

That is a situation that concerns Thomas Sheridan, professor of engineering and applied psychology at the Massachusetts Institute of Technology (MIT), who heads MIT's Man-Machine Systems Laboratory and is a consultant to several nuclear-related industries. "There have been two or three committees since Three Mile Island," Sheridan says, "which have looked a bit aghast at the fact that the simulators people have been trained on are different from the control rooms they actually operate. In some cases they are even mirror images. That is to say, the control board is laid out in just the reverse order of the one they are used to operating." It is like going from the United States to England to drive an automobile. Would an operator in a crisis do what Americans have been known to do in panic on an English highway—swerve to the wrong side of the road?

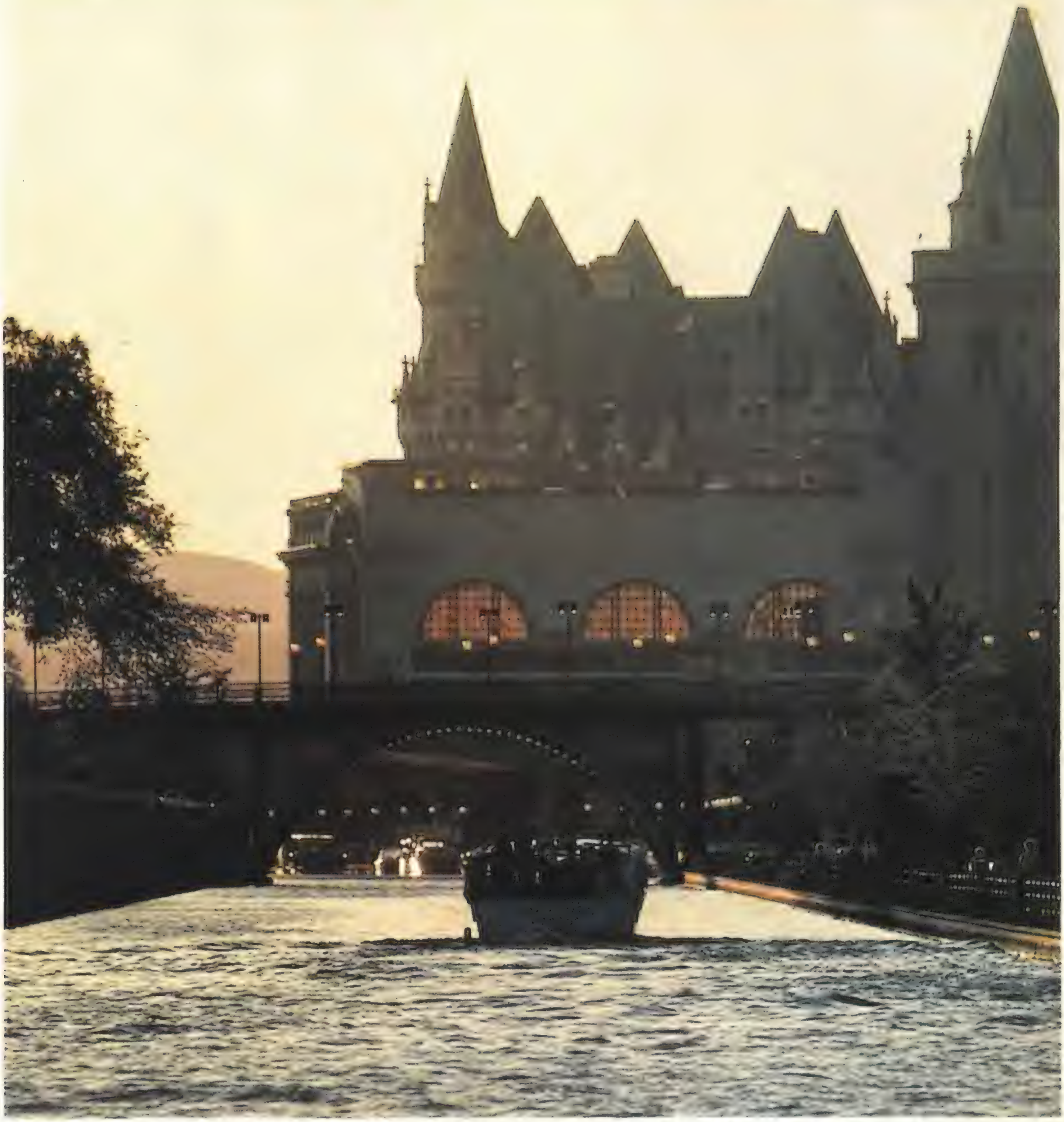
Sheridan thinks simulators could be used imaginatively to train people "in a greater variety of situations, so you get the operators accustomed to playing the game of diagnosing bizarre things." In fact, he once proposed that teams of reactor operators be put to work on simulators competing with one another, "trying to outfox the other team with the most exotic accident." The idea has not gone over, he says, perhaps because "the industry doesn't want to be seen as groups of people who play games with one another." But the game might reveal unanticipated problems before they have a chance to happen in reality. Indeed, the greatest value of a simulator may be to increase an operator's mental agility.

Consider a recent incident at Crystal River, Florida, with a three-year-old reactor designed for the Florida Power Corporation by the same people who designed the reactor at Three Mile Island.

The trouble arose on February 26 from a faulty electronics system which gave false information to the operators and actually instructed the nuclear plant to do things it ought not to have done. A short circuit appeared in the non-nuclear section of the control panel. The electric power supply to some of the instruments on the control panel went dim. Certain temperature readings on the panel dropped. As a result, the Integrated Control System, the brain which runs the plant during normal operations, "thought" the system was running too cold and ordered the control rods lifted from the reactor core. The system started to heat up, pressure began rising until it reached the alarm level, and then—within seconds—the reactor shut down automatically. It was forced to stop by special backup systems, designed for emergencies such as this. Over the next two hours, 40,000 gallons of radioactive water were dumped onto the floor of the

*Eliot Marshall, a writer for* Science *magazine, often reports on post-Three Mile Island nuclear technology.*

"capital sights"



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reactor building—though no equipment was damaged.

Because they were well trained, the operators at Crystal River quickly realized that they could not trust all the information they were being given by the control panel. They saw that mistakes were being made and realized they would have to match wits with the automated system. For example, the short circuit caused a critical valve to stay open when it should have been closed. An operator diagnosed the situation correctly within minutes. He activated a manual switch and closed a backup valve to stop the leak. Because he was properly trained to second-guess automation and computers, the operator probably averted a worse accident.

There may never be a championship tournament of nuclear-reactor operators, but Crystal River underscored again the need for operators who can meet unexpected challenges.

Simulator control board for Perry (Ohio) nuclear plant, not yet in operation, will begin preparing operators for potential mishaps well before the plant has been fired up to generate its first kilowatt.

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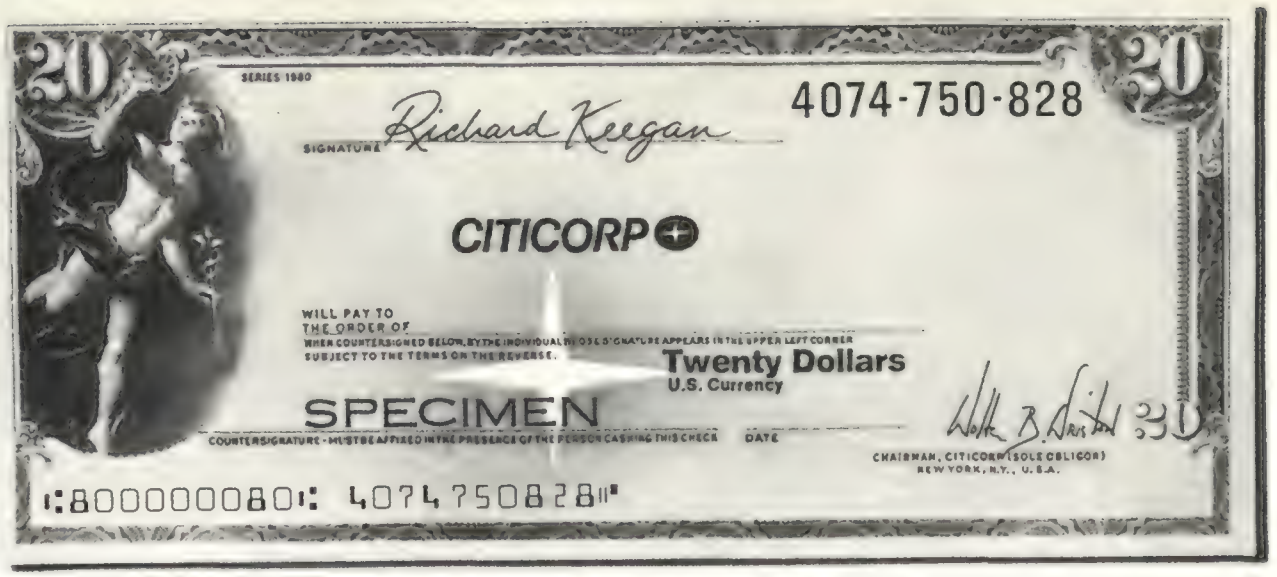


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Mallorca, Spain
Koeln, Germany
Innaloo, Australia
Gengenbach, Germany
Alicante, Spain
Viseu, Portugal
Nagoya, Japan
Mana, Ecuador
Macelo, Brazil
Clinton, Oklahoma
Papakura, New Zealand
New Plymouth, New Zealand
Aarau, Switzerland
Wichita, Kansas
Lorient, France
Yorkshire, England
Torino, Italy
Belfort, France
Belo Horizonte, Brazil
Montbrison, France
Michoican, Mexico
Toledo, Spain
Lower Hutt, New Zealand
Manchester, England
Sanne, Switzerland
Tenerife, Canary Islands
Annapolis, Maryland
Tappahannock, Virginia
Svendborg, Denmark
Gorinchem, Netherlands
Aubagne, France
Knoxville, Tennessee
Ames, Iowa
Belconnen, Australia

Prague, Czechoslovakia
Hamilton, New Zealand
Lima, Ohio
Barranquilla, Colombia
Colts Neck, New Jersey
Montreux, Switzerland
Te Awamuto, New Zealand
Rutland, Vermont
Ankara, Turkey
Koohsiung, Taiwan
Cork, Ireland
Memphis, Tennessee
Nancy, France
Bombay, India
Rarotonga, Cook Islands
Veracruz, Mexico
Algiers, Algeria
Brisbane, Australia
Hartford, Connecticut
Barquisimeto, Venezuela
Goteborg, Sweden
Chantilly, France
Sevilla, Spain
Aubonne, Switzerland
Kiel, Germany
Augusta, Maine
Perugia, Italy
Oxford, England
Minneapolis, Minnesota
Niamey, Niger
Sydney, Australia
Ponta del Gada, Azores
Keene, New Hampshire
Santo Domingo, Dominican Republic
Antwerpen, Belgium
Limassol, Cyprus
Lima, Peru
Copenhagen, Denmark
Pucallpa, Peru
Chicago, Illinois
Addis Ababa, Ethiopia
Tel Aviv, Israel
Davenport, Iowa
Kingston, Jamaica
Jackson, Mississippi
Agra, India
Mermaid Beach, Australia
Durham, North Carolina
Labasa, Fiji Islands
Split, Yugoslavia
Palma de Mallorca, Spain
Khartoum, Sudan
New Orleans, Louisiana
Lachen, Switzerland
Sapporo, Japan
El Dorado, Kansas
Graz, Austria
Cortland, New York
Saint Denis, France
Acapulco, Mexico
Faaborg, Denmark
Mont a Mousson, France
Upper Hutt, New Zealand
St. Louis, Missouri
Tegucigalpa, Honduras
Albury, Australia
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Sioux City, Iowa
Firenze, Italy

Rio Bravo, Mexico
Ghent, Belgium
Oslo, Norway
New Delhi, India
Brie Comte Robert, France
San Francisco, California
Thessalonike, Greece
Columbus, Ohio
Maroubra Junction, Australia
Durango, Mexico
Flagstaff, Arizona
Lugano, Switzerland
Lacey, Washington
Rakiraki, Fiji Islands
Terni, Italy
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Manila, Philippines
Birmingham, Alabama
Moonee Ponds, Australia
Gravesend, England
Chihuahua, Mexico
Tokyo, Japan
Garoua, Cameroons
Selangor, Malaysia
Croydon, England
Dayton, Ohio

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Rotterdam, Netherlands
Rugby, England
Rabat, Morocco
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Valley City, North Dakota
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Laramie, Wyoming
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Arkansas City, Kansas
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Kenmore, Australia
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Motueka, New Zealand
Sonora, Mexico
Tamaulipas, Mexico
Pine Bluff, Arkansas
Pauillac, France
Chesapeake, Virginia
Pamplona, Spain
Avellino, Italy
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Otorahanga, New Zealand
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Port Villa, New Hebrides
La Fleche, France
Otahuhu, New Zealand
Norfolk, Nebraska
Riley, Kansas
Salem, Virginia
Bedford, England
Freiburg, Germany
Newcastle, Australia
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*Article and photographs by Timothy Ehlen*

# A tall ship tracks Magellan, Elcano around the world

*Spanish midshipmen on nine-month voyage bear up under royal ceremony and cabin fever as they emulate the first circumnavigators*

Statue of Juan Sebastián de Elcano adorns his native port, Guetaria. He completed Magellan's voyage.

Today's *Juan Sebastián de Elcano,* training ship for Spain's navy, is a four-masted topsail schooner,

Among all the high-seas adventures of history one voyage stands out, staggering in its dimensions, its accomplishments and significance. This was the first circumnavigation—the first voyage around the world—called by historian Samuel Eliot Morison the "greatest voyage of discovery in all history" (SMITHSONIAN, February 1974).

Fortunately, it is also one of the best recorded. For when Ferdinand Magellan proposed it to Charles V of Spain in 1518, a young attendant to the Papal am-

some 370 feet overall. Here, photographed in the Indian Ocean from her launch, she wears all her sails.

bassador got wind of it and quickly recognized a great opportunity. Antonio Pigafetta wangled a berth on the voyage and kept meticulous journals of it. Through him we know many details of the epic voyage. Through him, too, generations of school children have learned very little of the man who actually completed the voyage: Juan Sebastián de Elcano, a captain in Magellan's fleet. Pigafetta was so maniacally loyal to Magellan that he never mentioned Elcano.

Yet to Elcano had fallen the task of rescuing the last survivors of Magellan's fleet. Starving, riddled with scurvy, nearly 200 of the fleet's complement died on the voyage. Magellan had faced mutiny, and one of the rebellious captains had indeed been Elcano. Then after the loss of one ship after another and the Admiral's death in the Philippines, the vessel *Victoria* returned to Spain with Elcano in command and 17 sailors working the ship. These were the first men to circle the world and the credit for the completion of the voyage must go to Elcano, who has so often been

Buenos Aires girls in *Elcano* T-shirts bid a noisy farewell as young Spaniards set sail after Christmas.

given short shrift by historians—including Morison.

A controversial figure because of testimony which placed Magellan in an unfavorable light at a Commission of Enquiry following the circumnavigation, Elcano was a Basque from the tiny fishing village of Guetaria on Spain's Cantabrian coast. He was a skilled navigator who had owned and captained a ship larger than any in Magellan's armada, a man pious but ruthless, heroic but vain (he delighted in clothes of satin, velvet and brocade, sweeping cloaks and plumed hats), ambitious but with paternal concern for his men. And the Spanish remember him with gratitude. Spain's naval training ship, a four-masted topsail schooner which took part in the Operation Sail voyages of 1976 (SMITHSONIAN, September 1976), is named for him. To commemorate her 50th year, the training ship *Juan Sebastián de Elcano* followed the lead of her namesake, touching at many of the same ports that Magellan and Elcano visited in the early 16th century. Like Pigafetta, I too signed on to witness and record this latter circling of the globe. In nine and one-half months at sea (Elcano took considerably longer—1519 to 1522), I watched our splendid ship and her young crew relive history in a very real sense, for men, sailing ships and the sea itself change little.

### *Fanfare and royalty*

We sailed from Cádiz on a breezy November day. The fanfare that accompanied us must have matched that of the first voyage, when Magellan's flotilla of five tiny ships slipped out of Sanlúcar de Barrameda in September 1519. We even had a visit from the King, Juan Carlos I.

He spoke briefly—the entire population seemed to line the shore, applauding whenever they glimpsed him. He concluded his speech with the shout "Viva España!" which was taken up by every soul on board and ashore.

The young monarch returned to his own gunboat and with the help of a tug to clear our bow we slowly pulled away from shore. Spectator vessels fell in beside us and military helicopters thudded overhead. Our great sails creaked up, were sheeted home and then cracked as the wind filled them. We heeled slightly and swung on course, our deck gun pounding off a 21-gun salute. Gradually the royal gunboat veered away, heading back to land. We settled into the business of sailing, taking a course southeast toward Tenerife, heading around the world.

The first leg of our journey was in the nature of a shakedown cruise—a chance to get used to ship and shipmates. Since I was neither one of the crew nor one of the midshipmen, but a working guest, I was given quarters in the sick bay where I had plenty of time to

Don Juan de Bourbón y Battenberg, father of Spain's king, pins medal on Alfonso, the ship's veteran cook. Captain (center) watches the course. At right, sailors in whites "dress ship" along bowsprit.

write. On those first days we were often becalmed and I found myself sleeping a lot.

The ship, however, functioned beautifully, and though new to her, the crew handled sails and lines without incident. Like all Spaniards they had great regard for the past and for the preservation of customs like the feast of San Carlos. It fell on a Saturday, so a party was in order for that night—especially since one of our officers was named Carlos.

We ate sumptuously and then, brandishing a sword, an officer neatly whacked the neck off a champagne bottle. I was impressed by this custom, and, noting this, my young comrades insisted that I try my hand at the next bottle. I followed the instructions (all in Spanish), stroking the blade along the glass to the neck, then yanking the bottle back as I pressed the blade forward. Off came the top, followed by a gush of champagne.

At the Canaries we picked up the northeast trades, the winds that carried Columbus to the New World, that sent Magellan and Elcano on their way. With our canvas full, we sailed for Rio de Janeiro, a full month away. This, too, was Magellan's first port of call in the New World, the logical place to begin his search for a strait that would see him through that endless coastline and point the way to the Spice Islands.

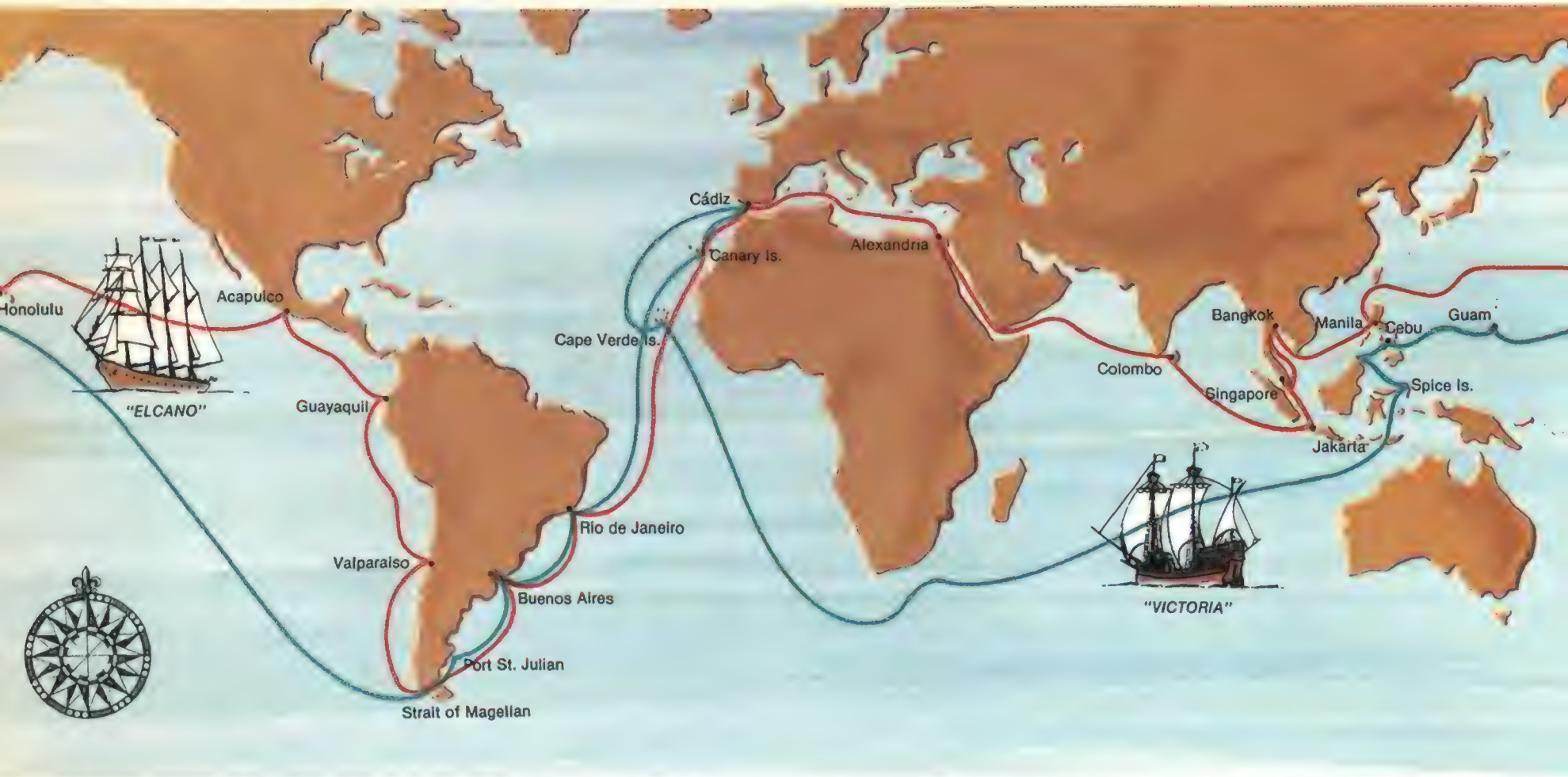
Our voyage was fair, the seas calm. We got through the doldrums, keeping our sails flying much of the time, for our captain was an avid small-boat sailor. Our midshipmen settled into the sea routine of classes, standing watch and handling the ship. Like many nations, Spain believes that only a sailing vessel can teach seamanship—the knowledge of how a ship reacts to the elements, to the pulse of wind and waves.

We crossed the Equator, and all hands shared in the King Neptune ceremony. And then, at last, we entered Rio, gazing up at the low clouds on the top of Sugar Loaf, at the other green-clad mountains cascading down into the harbor. Magellan made his landfall here 460 years earlier, and his men, after 12 weeks at sea, were eager for it.

We were, too. We were not met by naked natives swimming to the ship, as was Magellan, but we made a noisy entry, swapping salutes with the naval shore battery before putting in. Then liberty—the beaches of Ipanema, Copacabana and Botafogo, the sunbathing girls, deliciously tanned, the mountains in the background, the lights of the city at night . . .

It was a short nine days to our next port, Buenos Aires, where Magellan, too, had put in, then turned away again when he found that the muddy water of the Río de la Plata turned from brackish to fresh and so could not be his long-sought strait. We spent Christmas Eve at anchor off Montevideo, having gone through our first real storm. We had scurried through mounting seas with winds gusting to 55 knots. Waves slammed over the decks and we braced against each crash, our ears filled with the howl of the wind in the rigging. I had felt like a real sailor, wind in my hair, spray on my face, Dramamine in my pocket. Now shore lights blinked across the anchorage and the mid-

*Tim Ehlen sailed on* Elcano *during Bicentennial's Operation Sail. His story appeared in September 1976.*




First circumnavigation, begun by Magellan in 1519, completed by Elcano three years later, is in blue; the recent *Elcano* voyage, in red. Magellan's port, Sanlúcar de Barrameda, is 20 miles north of Cádiz.

shipmen put on a caroling party with songs in both Spanish and English.

I dined in the wardroom with the Captain and Exec. Then stopped at the rail on my way back to my quarters, looked out at the sparkling lights and, perhaps for the first time, felt lonely at being far from home.

On the day after Christmas we entered Buenos Aires and because of the cordiality between Spain and Argentina we were treated as special guests. John Travolta was the rage when we were there and disco the thing to do. Every night. On New Year's Eve, every ship was decked out with lights and just before midnight began blasting away with horns. At 8 o'clock we rang our bell 12 times for the New Year in Spain, then again at midnight and once more at 2 A.M. for my New Year back home in Michigan.

Thoughts of home vanished as we set out on our next leg into the latitude of the Roaring Forties. But the seas proved tranquil. On this leg of his voyage, Magellan pulled into Port St. Julian in Patagonia to spend the winter and to face mutiny. He subdued it ruthlessly, executing two captains and condemning to death—but finally sparing—some 40 men, among them Elcano, who, feeling his cause was just, had played a significant part in the uprising. We sped past St. Julian, now an obscure Argentine port, on our way to the Strait of Magellan and the Pacific.

After 71 days on the high seas and 7,800 miles, we reached the *Cabo de las Virgenes,* the eastern entrance to the Strait of Magellan. We entered a wide, calm bay, rimmed on the north and south by gentle hills. It is here that the land pinches the water into narrows that test the vessels that brave them. In First Narrows the tide can be 36 feet, with a current running at eight knots. Second Narrows is almost as bad. Through these two stretches of raging water Magellan took his little fleet without aid of charts, shore lights or previous knowledge of the waters.

He lost a ship here. It was not the conditions, the lurking rocks, that claimed her but a second, successful mutiny. Just inside the Second Narrows, the crew of *San Antonio* overpowered their captain, put him in irons and returned to Spain.

We were spared mutiny. And at latitude 53° 54′ we turned north for the first time since leaving Spain. We had reached the southernmost point of the South American continent. Our passage was quiet. We motored through the turbulent waters that night, past Punta Arenas, and as dawn brightened the sky we swung north and had an uncommon encounter. It was a sailboat, a Swan 55 skippered by a submarine commander of the Chilean navy, heading from Valparaiso to Buenos Aires. And she stormed past us under the press of a full starcut spinnaker. Our captain radioed

Deckhands huddle for warmth under storm sail as *Elcano* heads into chilly, far southern latitudes.

"Bravo Zulu" ("Well done!") and the 11-man crew of the sailboat lined the deck in salute as we passed.

Magellan made the passage through his strait in 38 days. We made it in two. He did it, of course, entirely under sail, anchoring every night. We did the whole 300 miles under power, stopping only once to wait for the current to subside. On November 28, 1520, Magellan left the strait and faced the unknown immensity of the Pacific.

And at this point our voyages differed. For we sailed north along the South American coast, calling at Chile, Ecuador and Mexico before heading west toward Honolulu and Manila.

Our 23-day voyage from Mexico to Honolulu was our best record so far. Trade winds sent us pounding across the Pacific at better than 200 miles a day—not bad for a vessel a half-century old! We felt we deserved the five-day layover in Hawaii. Yet Magellan's crews, sailing 98 days from the Strait to Guam, had no sight of land, no fresh supplies. In the time it took them to cross the Pacific we visited four countries, spent 22 days ashore and covered nearly half the distance from Hawaii to Manila.

In Hawaii we took on a new passenger: Don Juan de Bourbón y Battenberg, Count of Barcelona, honorary Admiral of the Spanish Navy and father of the King of Spain. He had been a sailor all his life, training largely with Britain's Royal Navy. It was amusing to hear his brisk British accent, referring to "leftenants."

A few days out of Honolulu we crossed the International Date Line and gained 24 hours. When the announcement was made to the crew, there was general

Under power, the training ship threaded Strait of Magellan in 48 hours. It took Magellan 38 days.

agreement that we were headed back to Spain. Never mind that we still had months to go. We were now headed home, and a celebration broke out.

A long sea voyage requires busyness by all hands. Everyone from captain to lowliest sailor must keep himself occupied or go crazy. Aboard *Elcano* we had an entire ship to chip and paint, and when the men finished it was time to start all over again. Our executive officer, Julio Alberto Fararo, said that if he had to he would form bucket brigades so the crew could transport water from port to starboard and back again —just to keep busy.

Sometimes it wasn't enough. And when a fight would break out, we would all be frightened by it, for the anger and frustration, so long contained, seemed to make madmen of the combatants. The fighters would be pulled apart and their emotions soothed, and then we would walk away in silent shame, blaming no one, realizing that it could happen again to any of us.

The Spanish call this state of mind *mamparitis*—literally, craziness from being within the frame of a ship. It was a very real fact of life in Magellan's time. It was in ours, too.

From Mexico to Manila took us 55 days, not counting the layover in Hawaii. We were under sail almost the whole time, using fresh, steady winds. We carried an incredible grey box, a Magnavox Satellite Navigator, that gave our position to within less than a mile. Its tiny TV screen also blinked out Greenwich Mean Time, date, course, heading, distance to a given point as well as our latitude and longitude. It could do other tricks, too—everything but provide the evening news and *Mork and Mindy*.

Our course carried us past Guam, but we did not put in. Magellan, heading just this way, was forced to land here—his first landfall after the Strait. Weakened by poor food and scurvy, his sailors were unable to repel natives who swarmed aboard his flagship and took everything they could get their hands on—belaying pins, lines, compass, casks. Pigafetta noted that they would have stolen the paint off his ship if they could. "They are poor but ingenious, and great thieves," he wrote. And Magellan bestowed the name *Islas de Ladrones* (Isles of Thieves) on Guam and its outlying islands.

After that visit to Guam, Magellan led his three remaining ships on to the Philippines and through that maze of islands to Cebu. And on neighboring Mactan, in a zealous attempt to defeat the enemies of a friendly sultan, he lost his life. He waged an ill-planned battle,

Life on board included Spanish military custom of opening the champagne with a sword (left), music and dancing (center) and firing salutes with deck guns to mark a feast day or enter a port.

In the somewhat chilling but revered tradition of the sea, these sailors balance on a footrope and claw at one of *Elcano's* square sails to furl it. The vessel is square-rigged on her foremast.

taking on a staggering number of natives out of range of his own cannon. The islanders he was trying to subdue overwhelmed him and hacked him to bits.

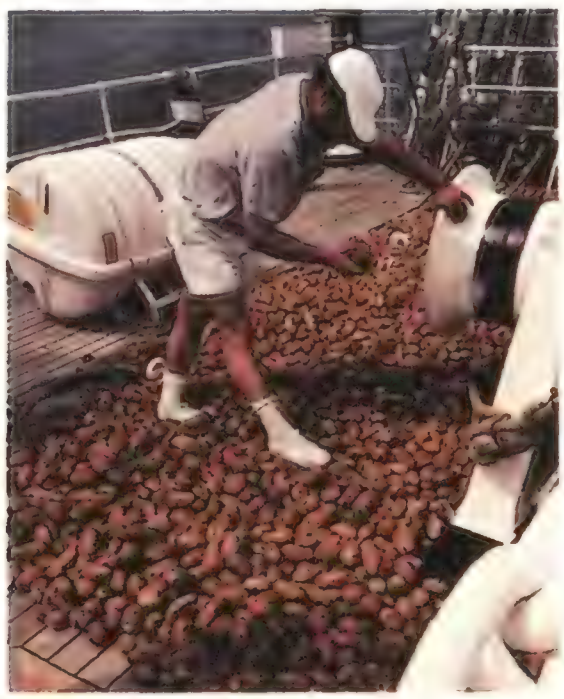
The tragedy succeeded in breaking apart the remains of the fleet. One vessel had been wrecked off Patagonia, another headed back toward Spain and was never seen again. Now another was destroyed. The last two, with cargoes of spice, tried for home on opposite courses—*Trinidad* heading for Panama hoping her crew could cross the isthmus, *Victoria* continuing around the world with Elcano in command.

After we made port in Manila I took a day to fly down to Cebu and Mactan to visit the site of Magellan's death. Two little girls were netting small fish in the shallows that had once been clouded with blood. The landing place is marked by two monuments, one tall and golden—a native warrior with sword and shield, the other a simple stone tower to Magellan. In the basilica at Cebu is the only relic of the admiral, an elegant statue of the Christ Child, *Santo Niño,* garbed in red velvet, which he gave to the Sultana. Hundreds of people each day pray at the image. Magellan's Christianity was deeply rooted.

In Manila we were wined and dined, but in the back of our minds was a yen to get back to sea, to the life we had come both to despise and to love. Every mile of the voyage now was taking us nearer home.

On our way through the South China Sea and the Gulf of Thailand to Bangkok, good old *Elcano* logged her millionth nautical mile. We felt we'd been along for all of them.

Singapore was clean, modern, green with parks and



Endless chipping and painting kept crew busy topside. On home stretch potatoes began going bad, were culled on deck. Always, there were shouted orders when one hurried to lay hold of a line and haul away.

gardens, a shoppers' paradise offering lures from electronics to batik to ivory to Persian rugs. Wrapping paper and empty boxes littered the ship's quarters. Tables were crammed with stereos and headphones, and underfoot were two remote control cars, banging into chair legs and ankles. Cameras were everywhere.

To the sounds of Peter Frampton and the Bee Gees —sounds Elcano never knew—we took a two-day voyage to Jakarta. And there one of our crew members died of an acute attack of appendicitis. He was one of our cooks, a part of our lives, a young man with a sort of Oriental look whom we called "Chino." Losing a crew member was like losing part of a whole organism. Elcano had lost many, and how hard it must have been for those long-ago sailors, constantly facing the unknown, to have to pause, almost continually, and commit another comrade to the sea.

From Indonesia we crossed the Indian Ocean to Colombo. Two days before we reached Sri Lanka we got caught by a 70-knot gust and our main course was blown to ribbons before we could shorten all sail.

On days of smooth sailing we practiced "man overboard" drill, and one day we put a motor launch out to view our ship under full sail. I had been aboard so long that I'd forgotten how beautiful she is. One Sunday was a feast day, that of San Juan, patron saint of the King, of this ship and of 28 members of our crew. We greeted the dawn with a 21-gun salute, then dressed our topgallant, the uppermost square sail, to Spanish sailors the "Juanete" or "Little John."

At noon we fired off another salute, then it was beer for all hands, and finally all the Juans on the ship climbed up to Juanete, scrambling up the ratlines and inching out on the footropes along the yard. The oldest man to do it was 47-year-old Juan, a machinist. He'd never been in the tops before and was hardly in his element far above the pitching deck. But he made it, white knuckles and all, and was roundly cheered.

Leaving Colombo, we sailed for our last foreign port, Alexandria. We started off as salty as can be, leaving Colombo without help from a tug, in fact using sail alone to clear the dock. For two weeks we had routine weather, and then came the worst storm of the circumnavigation.

Steering northeast toward the Strait of Bab el Mandeb, entrance to the Red Sea, we met 41- to 47-knot winds, seas running at 24 feet and occasionally breaking high enough to douse the bridge, 35 feet up. At first it was fun—everyone shooting pictures with those Singapore cameras. Then the cooks gave up trying to get meals. They couldn't keep the kettles on the burners. Another storm struck as the first eased. And in the hold, battened down against the weather, our potatoes and other supplies began to go bad.

We shortened rations. Not that we were near starving, but it served as a reminder of the terrible trials of Magellan's men, who ate the leather chafing gear off the yards. Moreover, nearly 100 of our men came down with high fever, including scattered cases of typhoid picked up in Indonesia. We were grateful for the Suez Canal, cutting in half the voyage that Elcano faced around the Cape of Good Hope.

Alexandria gave us a final shore leave before the voyage home. And then we had an extra port crammed into our schedule for an important reason. At Palma de Mallorca we took aboard Juan Carlos and 12-year-old Prince Philip. The event was preceded by a complete cleanup. Everything that didn't move was scraped, sanded, polished or painted, buffed or varnished. And just as we were nearly ready we passed through a pall of ash from a Greek island volcano and had to dust everything all over again.

At last the royal passengers were rowed out in our longboat, ten midshipmen manning the oars. And so for the last days we lived in a whirl of ceremonies and parties with one thought forever uppermost in our minds: Almost home! Almost home! Elcano's men could scarcely have felt the emotion any more than we did as Cádiz appeared, the three walls of its harbor white with the faces of thousands of people.

Our men make the mooring lines fast and stand in formation as bands play and families and girl friends scream from the shore. A sailor beside me explodes into rapid Spanish at the sight of his family. An officer flashes a smile of understanding as he quiets him and sends him back to formation.

And then at last dismissal. And it is over.

From under her bowsprit, *Elcano* seems to race like a greyhound. Figurehead was the only female aboard.

Part of Tenneco's continuing search for new energy supplies is this platform engaged in exploratory drilling in the Sabine Pass area of the Gulf of Mexico.

Another Tenneco Venture:

# Investing in energy.

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J.L. KETELSEN, CHAIRMAN
AND CHIEF EXECUTIVE OFFICER

During 1980, Tenneco will spend more than $1 billion on energy projects as the Company intensifies its efforts to develop new supplies. Our dominant corporate strategy since the 1973 oil embargo has been to increase production of American energy. The results are encouraging.

For example, as its contribution to the solution of the energy supply problem, Tenneco has:

- Increased its oil production in the United States by 17 percent since 1973, even though total domestic oil production was down by 7 percent.
- Increased its natural gas production in the U.S. by nearly 42 percent in the same period, while the industry dropped more than 13 percent.
- Increased capital investments in exploration and production from $124 million in 1973 to more than $850 million in 1979.
- Maintained a wildcat drilling success ratio of 29 percent, about double the industry average. The success rate of 85 percent for development wells drilled in 1979 was among the industry's best.
- Kept our aggressive course of replacing production with new reserves.
- Led the exploration of two frontier areas in the Atlantic Ocean, the Baltimore Canyon and the Southeast Georgia Embayment. We have more wells in those two areas than any other company. Two of the three wells in the Baltimore Canyon that tested hydrocarbons are on a tract in which Tenneco holds a 65 percent interest.
- Acquired interests in 15 tracts in the Georges Bank area off New England and three tracts in the Beaufort Sea off Alaska. We also acquired interests in 12 new tracts in the Gulf of Mexico during 1979, bringing our holdings there to 118 federal tracts.
- Continued to expand the Yowlumne Field in California, one of the largest fields discovered in this state in recent years.
- Made six discoveries in 1979 in the Williston Basin of North Dakota, another large area where proven reserves are still growing.
- Led the negotiations with the national petroleum company of Mexico, resulting in the initial importation of 300 million cubic feet of natural gas per day. About one-third of this gas flows into our 16,000-mile pipeline system which serves utilities and their customers in 24 states.
- Participated in many synthetic fuel research projects. We are partners in the nation's first commercial coal gasification plant in North Dakota, a $1.5 billion project. We have also formed our own coal company and have sufficient coal and water resources to supply several coal gasification plants.
- Become equal partners in the nation's most advanced oil-shale recovery project, which has an estimated 1.2 billion barrels of recoverable oil.
- Initiated a pilot project to produce heavy oil from tar sands in Alberta, and we are evaluating the potential for recovering natural gas from geopressurized saline water in Louisiana.

All these achievements and projects help reduce our nation's dependence on imported oil.

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# Tenneco

In a classic botanical format, this painting by Paul Breeden shows the entire Bradford pear tree, the small white flowers of spring and equally small fruits that follow. "Pears" are not edible.

*By Dennis Farney*

# Meet the men who risked their lives to find new plants

*Some of our most popular ornamentals, not to mention improved agricultural lines, arrived only after storybook adventures*

Dr. John Creech, who "rediscovered" the Bradford pear, examines its flowers at the National Arboretum.

John Creech knew trees the way some men know wines. It was his business to know them. And, by any standard, he knew this tree was extraordinary. Its origins were in a Chinese seed lot and it was given the Plant Introduction number 47261.

Its very history was steeped in romance. A man had died—suddenly, mysteriously, on a tramp river steamer half a world away—just after collecting the species *(Pyrus calleryana)* from which it was selected. His name was Frank Meyer; his death, in 1918, occurred two years before Creech was born. Yet by reading Meyer's yellowing letters, Creech could see him clearly. A loner and an adventurer. A morose idealist. A tireless hiker who had walked across some of the ruggedest, most majestic terrain on Earth—in Turkmenia, in Siberia, in Korea and China—on solitary hunts for exotic plants.

The tree itself was clearly a genetic elite. Nothing in its scraggly ancestors would have suggested the stately beauty that Creech studied now.

The tree welcomed spring with a cloud of snowy blossoms. Summer brought lime-green leaves, glossy with undulate margins; in fall they turned the color of claret and shone like polished leather. Even in winter, tiny, pea-sized pears clung to the upswept branches, food for songbirds. Furthermore, it was resistant to fire blight disease.

Creech was trained to appreciate such things. As Superintendent of the Agriculture Department's Plant Introduction Station, Glenn Dale, Maryland, he presided over a kind of immigration station for unusual plants. Trees, shrubs, flowers and grains from around the world were sent to his station, to be grown, propagated and evaluated. The best were released eventually to American nurserymen, experimental stations and botanical gardens.

Now, in the summer of 1950, Creech reached a decision. He would clone this tree, producing genetically identical offspring, then test the offspring as street trees in suburban Washington, D.C.

That decision gave us the Bradford pear, today one of the ten most popular ornamental trees in the eastern United States. The Bradford is beautiful in all seasons, resistant to urban pollution and widely available from retail nurseries. Its intermediate size (ultimate height: 30 to 50 feet) makes it ideal for suburban yards. Small wonder that at least 300,000 of them have been planted in three decades—all propagations of the single tree that caught Creech's eye.

But Creech's decision accomplished something more. It completed the work of Frank Meyer, a man little known while alive and all but forgotten in death. The story of Meyer and Creech, and their unusual collaboration, shows how modern plantsmen build upon the discoveries of the past. But, more to the point, it illustrates the contributions to horticul-

*A correspondent for* The Wall Street Journal, *the author last wrote for* SMITHSONIAN (July 1975) *on the restoration of America's tall-grass prairies.*

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Frank N. Meyer, Agriculture Department plant hunter, and J.J.C. de Leuw, his field assistant, strike a pose for the camera in Peking on February 6, 1915.

ture of a small band of adventurous men —the plant hunters.

Plant hunters are the middlemen of horticulture. They discover exotic plants in remote locations and introduce them to the world, sometimes directly, at other times through the work of plant breeders. It is an occupation that seems to attract a rare breed of man, a kind of combination poet and soldier of fortune.

Through the centuries, plant hunters have scaled mountains and crossed deserts, waded roaring rivers and shinnied up trees, fought off bandits and become caught up in wars. Yet, at bottom, most remained unabashed romantics. As one once put it, a plant hunter's finds remain "children of his heart."

To see those "children," just look around you.

Is there a rhododendron in your garden? Then you may well be indebted to Ernest Henry "Chinese" Wilson, a plant hunter who discovered 80 kinds of them —and a thousand other plants as well— on expeditions early in this century for Harvard University's Arnold Arboretum in Boston.

Wilson moved regally about the Orient amid a platoon of coolies, had an aide-de-camp he called "Boy" and, when in the field, slept on a cot whose legs were sur-

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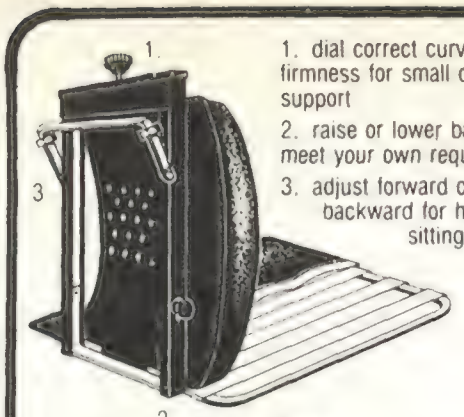


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Full of seeds and specimens, Meyer's carts are parked in courtyard of an inn.

rounded by moats of insecticide. He considered it essential to be seen in the company of a sedan chair. "A sedan chair is the outward and visible sign of respectability without which no traveler is properly equipped," he once explained. ". . . . Whether one rode in it or walked was immaterial; the important thing was its presence."

Altogether, Wilson introduced more than 1,000 species, including the colorful Kurume azaleas, the tea crab apple and the summer-blooming butterfly bush. But probably his best-known find is the pearl white and lilac-colored regal lily, now one of the most commonly grown lilies in the United States. It nearly cost him a leg.

Wilson was seeking this flower in a desolate section of southwestern China when an avalanche caught his party on a narrow ledge. He bounded out of his sedan chair just before a careening boulder smashed it to bits. Then a "hot wire" seemed to knife through his right leg: another boulder had broken it in two places. Wilson endured three days of pain while his coolies carried him to a doctor. At one point the leg became so badly infected that the doctors suggested amputation. But Wilson talked them out of it and eventually survived with nothing worse than a bad limp. He called it his "lily limp."

Is your lawn of zoysia grass? Zoysia was discovered in Japan around the turn of the century by David Fairchild, Frank Meyer's superior at the Agriculture Department. Fairchild also gave us some 30 kinds of Japanese flowering cherry trees,

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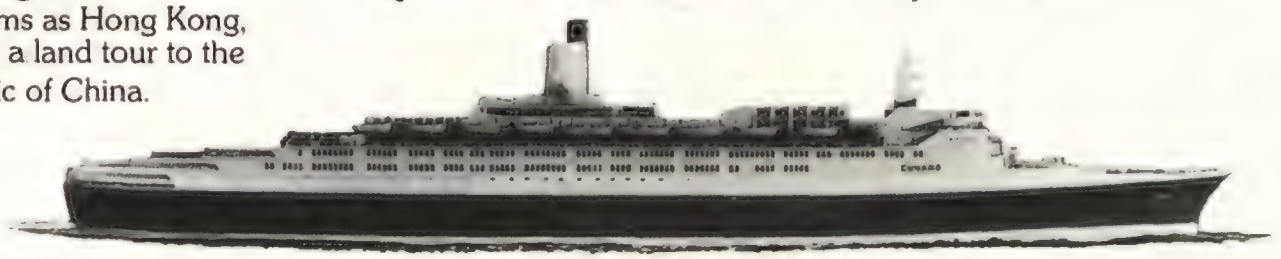

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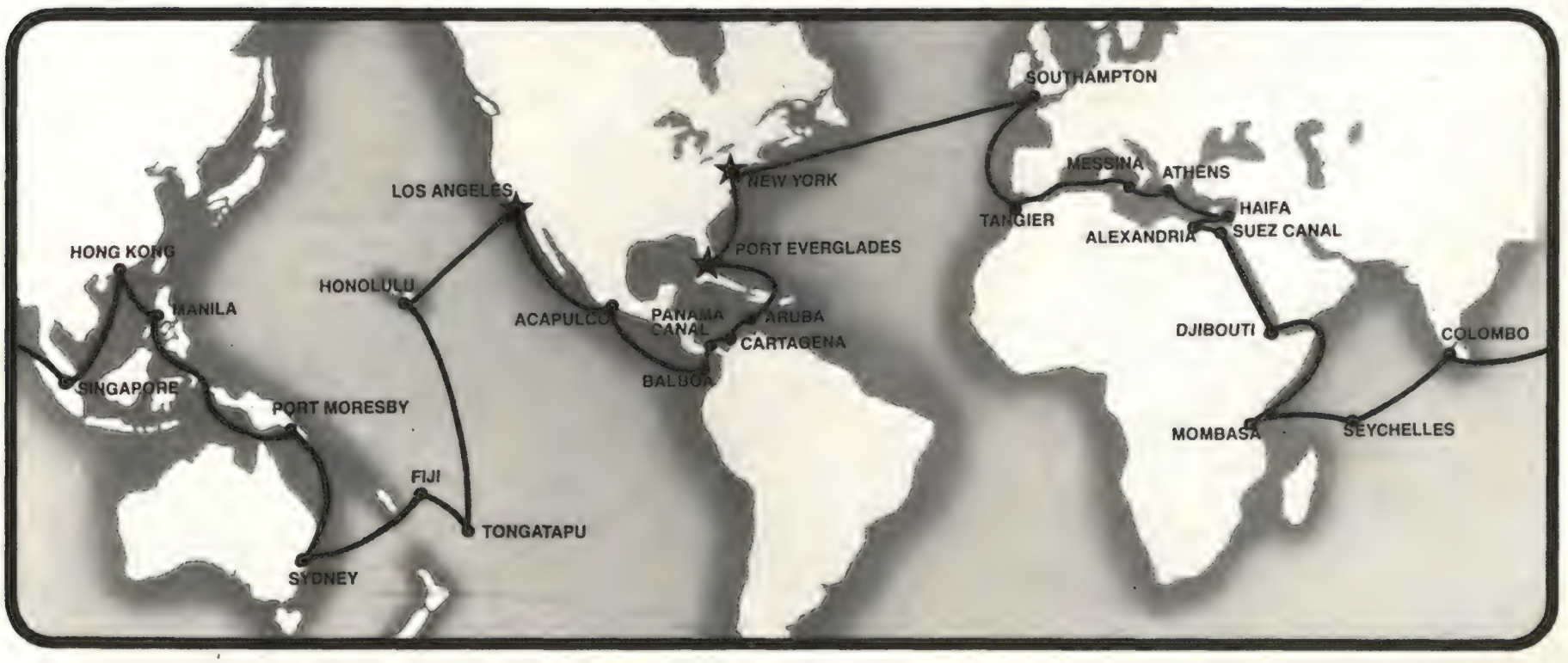

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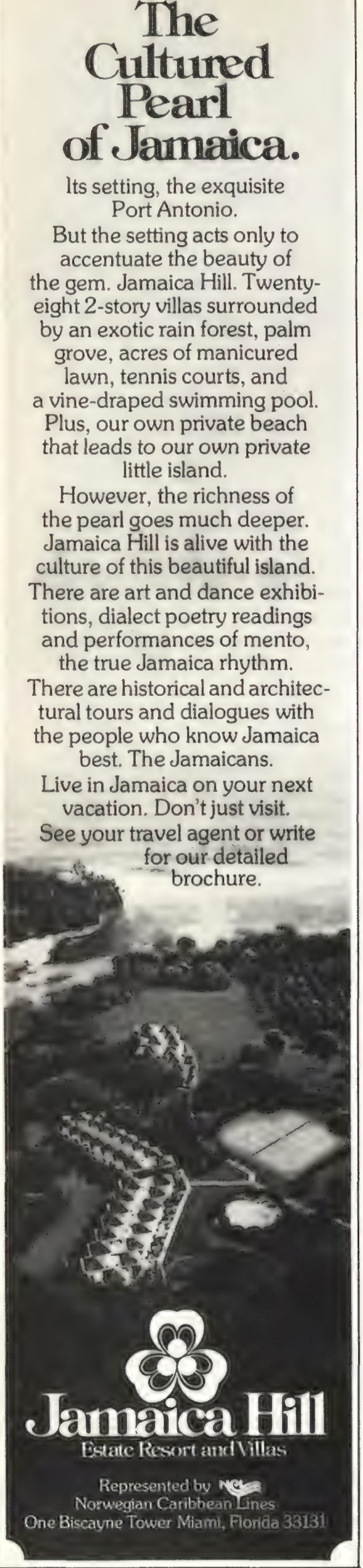

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among hundreds of other finds. His explorations once took him to the Fiji Islands. He didn't find any worthwhile plants there—but picked up the lore that the local "cannibals especially savored the thumb and the palm of the hand."

Modern wheat varieties have been developed, in part, from seed discovered in Russia; the honeydew melon also originated in that country. And so it goes. Thousands of plants, now so common as to seem thoroughly American, actually are foreigners, transplanted here by the plant hunters.

"Just about all U.S. crops are of foreign origin," says John Creech, who today directs the U.S. National Arboretum in Washington. "And if you go into the average garden in the eastern United States, probably 80 percent of the landscape plants you'll see originated in foreign countries."

Americans are latecomers to plant hunting, which dates from at least as far back as 1482 B.C., the year Egypt's Queen Hatshepsut dispatched a plant-hunting expedition to the African interior. Europeans dominated plant hunting from the 16th through the 19th centuries, discovering in Asia the tea rose, the iris, the camellia, the chrysanthemum and a host of other plants.

*American era in China*

American plant hunting began when Commodore Matthew Perry visited Japan in 1853 and took a plant collector along. The American era peaked between 1897 and 1934, a period of easy entry to China and Japan. This "golden age" was also the era of Frank Meyer—to John Creech, "the most romantic of all the Agriculture Department plant hunters."

Tough, wiry, taciturn, Meyer was better at walking than at talking. As a young man, he hiked from his native Holland to Italy, navigating by a compass. A blizzard almost killed him in the Alps; he took this in stride. Blizzards he could handle, people were a different matter entirely.

An idealist, Meyer spent a year in a Dutch utopian colony, but gave it up in frustration. "The serpent of selfishness was there also," he explained to a friend, Erwin Smith. But Meyer never ceased searching for a code to live by. "In philosophy," Smith wrote, "Meyer was a follower of Schopenhauer; in politics a Marxian Socialist; in religion a Buddhist."

Plants collected in Chinese interior are packed for shipment to United States.

Meyer remained forever awkward in social situations, ill at ease in cities. "The sky is too near," he'd complain on visits to Agriculture Department headquarters in Washington. A well-meaning friend once gave him a pinstriped suit; Meyer left it in his trunk until it turned green with mold. Paradoxically, this lonely, driven man probably was happiest while hiking across China, a country he considered to be barbaric.

Turn-of-the-century China tested Westerners to their limits. The roads were either poor or nonexistent. The inns were full of fleas. Hostility toward "foreign devils" was increasing. Bandits and brigands roamed the countryside. And for Meyer, the quintessential loner, there was a final burden: the throngs of curious, peering Chinese he attracted wherever he went.

"That the Chinese are curious nobody will deny," Meyer complained in a 1906 letter to Washington. "But when one arrives in the evening wet and tired and one has to undress, wash, eat and drink and sleep before the whole multitude, that is rather more than a man can stand."

Meyer's primary mission was not to find beautiful plants, but economically beneficial ones. On two great expeditions to Asia, he plunged into the task—once hiking 1,800 miles across Manchuria, another time fending off a bandit with a dagger. He succeeded admirably, sending back new varieties of soybeans, grains and cold-hardy fruit trees. A disease-resistant spinach that he discovered saved Virginia's spinach industry from ruin.

Then, in 1917, he began a third expedition to Asia. It was to be a fatal mission.

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Meyer returned to a China torn apart by violence. Rival factions struggled for control of the young Chinese republic; "fighting going on everywhere; outlaws in all provinces; just now it is unsafe to go outside Jehol even, so many robber bands are there," Meyer wrote his superior, David Fairchild, on October 25, 1917. Yet only four days later he reported that his latest project was progressing nicely: "The cleaning of 5,000 lbs. of pears proceeds all right and I have already over 25 pounds of clean dry seeds."

This referred to the callery pear (*Pyrus calleryana*), an Asian species. Scraggly and thorny, the typical callery pear was anything but beautiful, but the species seemed resistant to a blight that was then devastating American pear orchards. Meyer's superiors hoped to arrest the blight by crossbreeding U.S. pear varieties with the blight-resistant callery pear. It was for this utilitarian purpose—gathering seeds that would produce breeding stock—that Meyer was now risking his life.

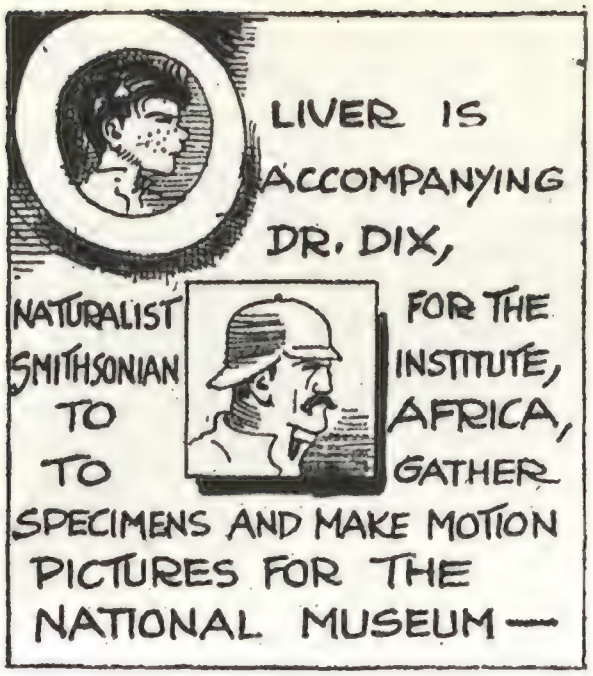
### *Letters from a war zone*

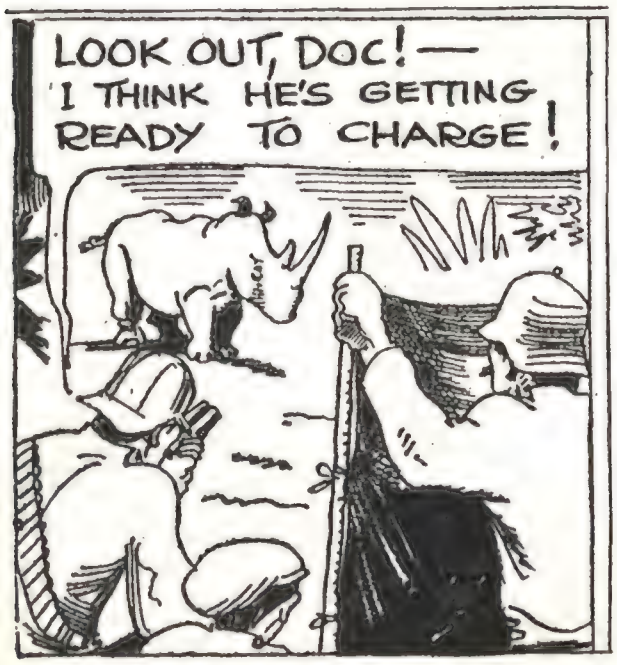
Meyer pushed inland, heading for the city of Ichang, in northeastern China. "Here I am sitting in a small hole of a town, all surrounded by high mountains, on which a slight snowfall has been deposited during the past night," he wrote on November 27. He made it to Ichang a few days later—and then the civil war closed in on him. Meyer, along with a handful of other Westerners, was trapped; he could do nothing but wait.

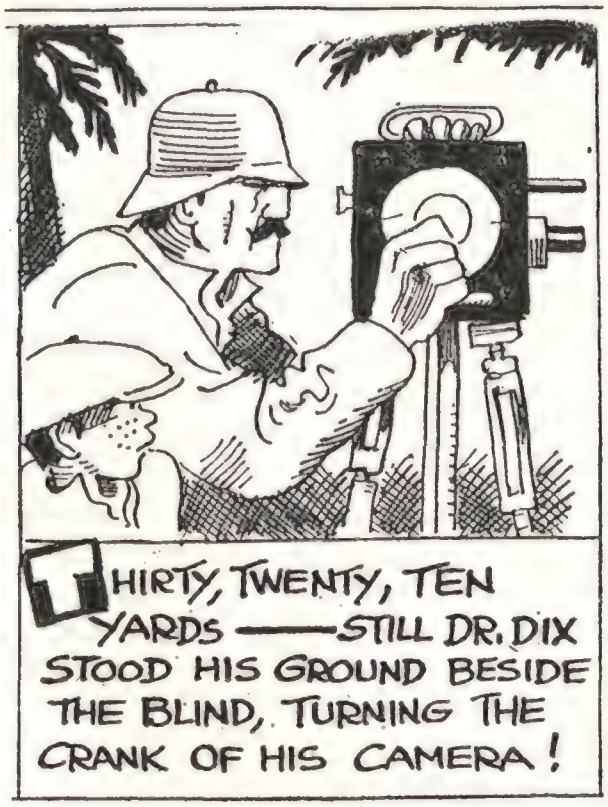
"As I am writing we hear the rickety noise of the rifle fire, for northern and southern troops are at battle only a mile or so north of the city," he wrote Fairchild on February 1, 1918. The letter talked of another exotic tree in the area, noted that "they murdered the magistrate of Patung a few weeks ago," and went on to talk of wild lemons.

Like some discordant counterpoint, the sights and sounds of war continued to run through Meyer's descriptions of trees and flowers.

"Food supplies are running low," he wrote from Ichang on March 6, 1918, "fighting occurs near and around the city almost hourly . . . and everybody feels depressed from this long-drawn state of suspension. The foreigners here have formed a defense committee," he said,


LIVER IS ACCOMPANYING DR. DIX, NATURALIST SMITHSONIAN FOR THE INSTITUTE, AFRICA, TO TO GATHER SPECIMENS AND MAKE MOTION PICTURES FOR THE NATIONAL MUSEUM—




This comic strip, set in Africa, was actually inspired by Meyer's travels in China. Adventures in exotic lands were very popular with the public.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With historical license, a Bradford pear grows in Williamsburg, Virginia.

"but of course a mere handful of white residents can do nothing against brigands in uniform. . . ."

To while away the time, Meyer was planting trees around the city. "Should all these various trees pull thru, my work will be tied up with this city for a hundred years to come," he wrote. Yet the same letter recounted a chilling discovery: a cluster of corpses, mutilated in "unspeakable ways." As Meyer had watched, horrified, soldiers "took out the hearts of some fellows they had shot. . . . They were going to eat these hearts to get courage!"

Finally, on May 18, Meyer wrote Fairchild that he had escaped Ichang and retrieved pear seeds stored in another town. In a curious, touching letter, he admonished his superior to see to it that Agriculture Department workers in far-off Washington got plenty of fresh air. And then the letter returned to the pear seeds, Meyer's preoccupation all the previous months.

"The pear seeds which I now have with me may not germinate to a great extent, but by keeping them . . . in cold storage they may still give fair returns. . . . Well, later on I'll answer more correspondence from you and from others in our office."

By fall the leaves have turned a vivid wine color; birds love the tiny fruit.

Two weeks later, in early June, Meyer's swollen corpse was found buried on the bank of the Yangtze River.

The death remains a mystery. Meyer simply vanished from a river steamer in the middle of the night. He may have been killed, he may have committed suicide, he simply may have become ill and fallen overboard. He was finally buried in Shanghai; his pear seeds eventually reached the United States, to be planted along with many other collections of *Pyrus calleryana* subsequently introduced.

The seeds were first planted in California at another Agriculture Department plant introduction station. Later, at a point lost in bureaucratic history, some of the resulting callery pear trees were dug up and shipped across the country to Glenn Dale. By 1950, the year of John Creech's decision, only four of the callery pear trees had survived—but one of them was superb. (Even that original tree has now died.)

Creech produced clones of that tree by grafting individual buds taken from it to seedlings of other pears. Each offspring was nearly identical to the parent, because the offspring's main above-ground portion grew from the callery bud.

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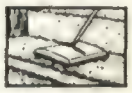

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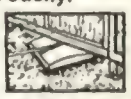

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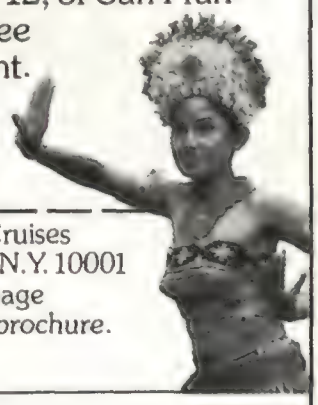

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streets of College Park, Maryland, in cooperation with local citizens, Creech named the tree for F. C. Bradford, a former Glenn Dale superintendent, and the department released it to commercial nurseries. Lady Bird Johnson boosted the new tree in 1966 by planting two Bradfords in front of the Agriculture Department on the Mall and, as Creech concludes proudly, "this tree has been a goer ever since."

So, in a sense, has Creech himself. Since 1955, he's gone on ten plant-hunting expeditions—to Nepal, to China, to Japan, to Taiwan and the Soviet Union, among other places. In 1957 he discovered a species of crape myrtle (*Lagerstroemia fouriei*) on the Japanese island of Yaku Shima. It has become the foundation for a massive National Arboretum breeding program under Dr. Donald Egolf that has already released three new hybrids to the public. In 1962, Creech backpacked, with Dr. F. de Vos (then of the National Arboretum), into Nepal, lived in a tent for two months and emerged with a beautiful new shrub, a cotoneaster released commercially under the name Emerald Spire. All told, John Creech and his teammates have brought back more than 2,500 foreign plants.

Creech reflects often on Frank Meyer and the profession they share. He's been poring over Meyer's collected letters as he writes of his own travels.

Plant hunting has changed enormously in scope since Meyer's day, says Creech. Meyer focused on plants new to cultivation in the United States; today's plant hunters struggle to preserve rare and endangered plants that are crop progenitors on a global scale, and often build on the results of earlier collectors' work. Yet, for all that, in its essentials, plant hunting has scarcely changed at all. "It's still you alone in the field, one man searching," Creech says.

John Creech believes Frank Meyer died an unhappy man. "He was an idealist. Throughout his letters, Meyer expressed concern about the trend of events, the violence, the war. He died, I think, somewhat morose, rather despondent about life in general." Indeed, in his last letter Meyer told David Fairchild: "Times certainly are sad and mad and from a scientific viewpoint so utterly unnecessary."

"In his wildest dreams," says Creech, "I doubt Meyer would have thought that his efforts would turn out this way. Yet how can any of us know what our discoveries will lead to? That's the way we progress in this business, each generation building upon the work of the ones before. I regard this tree as a memorial to him."

A white blaze of Bradford pear trees in full bloom decorates the grounds of the National Arboretum. Some 300,000 have been planted in this country so far.

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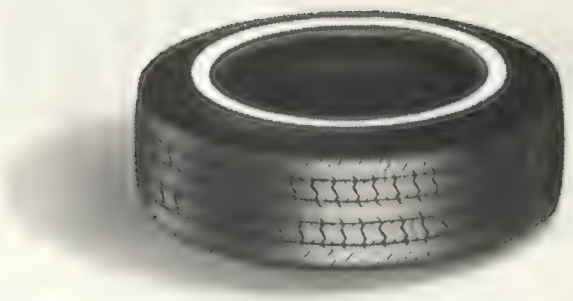

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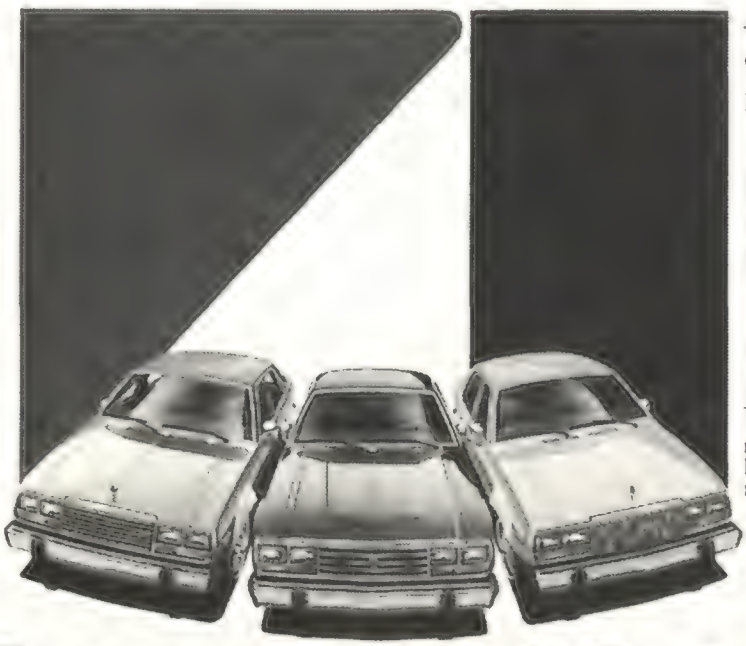

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*By Charles Maclean*

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*The author—seaman, journalist, cowboy —based this story on his forthcoming book,* Island on the Edge of the World.

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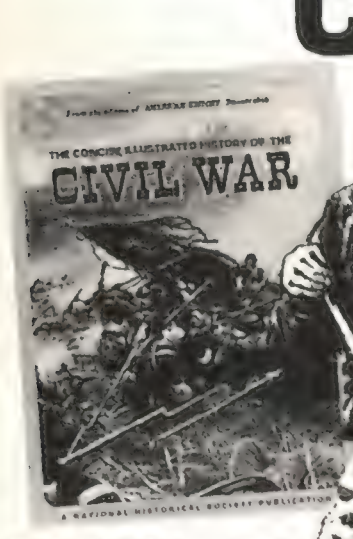


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The outline sharpens. A second landmass appears. Shoulders of cliffs descend into the ocean and reemerge as stacks (chimneylike rocks) and skerries (reefs), standing up out of the water like elbows and knees at angles of defiance. A ragged promontory extends a treacherous arm as the boat passes between it and a pyramid of rock, standing pale and massive in the middle of that forbidding sea waste, guarding the entrance to St. Kilda.

Rounding the promontory the boat comes out of the heavy Atlantic swell and enters the calmer waters of Village Bay. The bay is surrounded on three sides by green amphitheaterlike hills that cradle the ruined village of the old community. But the serenity of the landscape is deceptive, for these hills have no backs to them. They sweep up to their summits, then stop, as though bitten through the middle, falling sheer more than a thousand feet to the Atlantic below.

From the brow of the great cliffs the panorama of the Western Isles becomes visible. On most days St. Kilda has a round and empty horizon, but in fine weather a narrow blue line of land appears low in the east and the long chain of the Outer Hebrides can be made out.

The archipelago of St. Kilda, which consists of Hirta, Soay, Boreray and the Dun, lies out in the Atlantic Ocean on

"A dark extravagant shape" looms amidst crashing waves of the Atlantic.

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This view of fowling is from 1891, when the community was already declining.

Unlike fulmar and gannets, puffins were caught grown; all were taken at risk.

the edge of the continental shelf, 110 miles due west of the Scottish mainland. Cliff-bound and surrounded by deep water, the islands are as inaccessible as they are isolated. (Hirta, often referred to as St. Kilda, is the largest of the group and the only one inhabited in recent history.)

Hirta was probably once part of a much larger landmass and joined to the other islands in the group, but over the millennia erosion caused by direct exposure to the Atlantic has worked spectacular changes. All around the coast the effect of weather and waves can be seen in the compilations of rock, in the gaping caves and gigantic flying buttresses, in the towering stacks and broken-down skerries that encompass the island.

The climate of St. Kilda played a decisive part in the lives of the inhabitants and generally added to the isolation. The frequent storms that blow from September to April often made it impossible to get on or off the island for weeks at a time. In winter the days are short—just as at midsummer the night is only an hour long. Yet in spite of the wind and a northerly bleakness, the climate stays mild the year round. In summer there are sometimes long spells of clear, warm weather when the islands appear, as one of the St. Kildans put it, "under a white cap of summer haze, [like] no paradise on earth."

The islanders depended for their survival on the enormous colonies of gannets, fulmar and puffins that dominate the ecology and indeed the whole character of St. Kilda. The birds provide the land with fertilizer and the sea with nutrients from their droppings. Their incessant cries fill the air; their myriad flights crowd the skies.

Other seabirds, and land birds, too, use Hirta as a resting place. But the only bird that stays year round is the St. Kilda wren, a true subspecies and like the St.

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Islanders posed for charmed 19th-century tourists who introduced new dress, ideas and needs, helping to destroy their self-sufficiency and simplicity.

Kilda mouse—described in 1885 as the only wild animal on the island—probably a resident since before the last ice age.

The profusion and variety of birdlife on the islands provide plenty of opportunity for the ornithologists, but to the St. Kildans the birds were something else. The history of the islands is essentially the story of a bird culture, of a people whose existence depended on those seabirds that provided them with food, medicine, lighting, manure, shoes, a source of revenue, a way of life and often enough—when they broke their necks trying to catch them—a cause of death.

The early history of St. Kilda follows roughly the same pattern as other Hebridean islands. On Hirta, the largest in the group, there are numerous freshwater springs: lush-green and fertile, it must have seemed an ideal place to settle. Possibly Neolithic wanderers, Celtic invaders, early Christian anchorites and Vikings followed in succession, contributing to what soon became the islanders' unique way of life. Celtic Druidism gave ritual form to the St. Kildan's close relationship with nature, while early Christian precepts did much the same for his relationship with his fellowmen.

For most of its history St. Kilda appears to have been a self-supporting commonwealth with an economy suited to the terms of its own isolation. From the end of the 14th century until 1930 it belonged to the MacLeods of Harris and of Dunvegan, Skye. After survival, the St. Kildans had to produce enough surplus to pay the owner of the island rent.

A MacLeod steward visited St. Kilda once a year to see to the islanders' needs and collect the rent, which they paid chiefly in cloth, feathers, oil and dried carcasses of seabirds. Imports were limited mostly to bare necessities. Like the obligation to survive, paying the rent was the responsibility of the whole community. Arable land, pasture, livestock, fowling cliffs, boats and ropes were all held in common, yet at the same time scrupulously divided into plots and portions among the island's families—each contributing toward the rent according to an intricate system of ownership rights.

Decisions on all matters concerning the welfare of the community were made by the St. Kilda parliament, a deliberative assembly made up of all the grown males on the island. They met every morning except Sunday to decide what work should be done that day and to discuss a wide range of topics. Stories, myths, sagas and tales of bravery on the cliffs found their way onto the agenda.

Since there was virtually no crime on the island and disputes were easily settled, parliamentary business was mostly concerned with payment of the rent and the division of property. The parliament insured that no islander was raised above another and that all shared the common wealth or want.

In 1697 Martin Martin, a literary tutor to the MacLeods of Dunvegan, visited St. Kilda and wrote a compelling account of his visit. He found that life on St. Kilda

was simple and severe, but that its people were content. Beyond being well fed, well clothed and well housed, "the inhabitants of St. Kilda," he noted, "are much happier than the generality of mankind, as being the only people in the world who feel the sweetness of true liberty."

The St. Kildans—they were almost 200 strong at the end of the 17th century—lived above Village Bay in a long row of black houses called the Street. Some of the older houses were of a prehistoric beehive type, like the stone *cleits* dotted about the island in which the people stored food, peat and tools.

The islanders lived on a diet built around fulmar and gannets, which they ate either fresh in season, or cured. In 1697 Martin Martin reported that the previous year they caught 22,600 gannets —and this was considered a poor year. Seabird products were the prime wealth of the island. Fulmar oil was sold on the mainland for medical purposes and as fuel for heating and lighting. There was also a steady market for seabird feathers. By the end of the 19th century, however, the demand for these products fell away.

Both gannets and fulmar were harvested when young—before they could fly—from the nesting ledges on the cliffs. Puffins were taken fully grown and had to be caught with fowling rods or snares or sometimes by dogs, which were trained to pull them out of their burrows.

Traditionally, women did the spinning, and men the weaving and tailoring.


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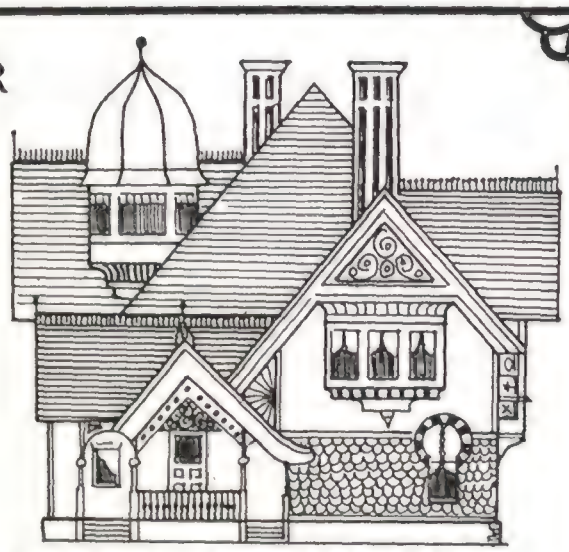

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The Reverend John MacKay, minister 1865-89, kept islanders from vital work.

Fowling was unquestionably the most important activity at St. Kilda. By the time boys were 16 they were fully fledged cragsmen. At the time of Martin's visit, a young St. Kildan could not marry before he had proved himself by displaying his courage and skill as a cragsman—in the ritual of the Mistress Stone. The potential bridegroom had to balance on the heel of one foot on the edge of a flat rock overlooking a sheer 250-foot drop to the ocean below, and hold this position until his friends were satisfied.

Before the 19th century, fowling on St. Kilda was regarded as a noble sport. Risks were taken for risk's sake and climbing accidents were common. A fall from the cliffs was usually fatal: the chief euphemism for death was a fowling expression —rather than talk of someone's having passed away, St. Kildans referred to his

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# Surprise:

Railroads move a ton of coal for an average charge of less than 2¢ a mile.

Finlay MacQueen's beard belies 17th-century note of "but a few hairs. . . ."

having "gone over it." Stories dramatizing the dangers of fowling perpetuated the myth of the heroic cragsman. But in later years as the male population decreased and the community began to lose faith in itself, fewer risks were taken and fowling lost much of its former prestige.

Yet St. Kilda always remained a fowling community, a bird culture, first and foremost. Fishing was never popular with the islanders, who used the few boats mainly for fowling expeditions and for tending sheep on the other islands in the group.

While farming provided a substantial part of the islanders' diet and contributed produce toward the rent, it was only a secondary occupation. They cultivated barley, corn and oats, but the summers were short and the return on the crops was poor. The harvest always had to be gathered early in case of storms.

The St. Kildans owned a small herd of cattle and about 7,500 sheep pastured on Hirta and Boreray. The sheep on Soay, which belonged to MacLeod, were a pure primitive breed probably descended from the wild mouflon and kept only for their wool. The islanders' own mixed-breed sheep were hardy and agile.

In winter the St. Kildans kept busy making tweed to clothe themselves and for export. The men were traditionally the island's weavers and tailors, but the women spun the yarn and had to work hard at a variety of other jobs—especially any which involved carrying.

The women had their own informal assembly and elected a queen from among the island's unmarried women, who led the female puffin-snaring expedition to Boreray every summer.

Rob Roy tartan, white muslin cap were "very fine." Cap frill indicated matron.

This tradition, a legend about a "Female Warrior" and certain anomalies in the division of labor between the sexes have given rise to the speculation that the island was first inhabited by a matriarchal society. It is unlikely, although perhaps not as farfetched as the popular fancy that St. Kilda was once part of Atlantis.

Except for the steward's yearly visit, communications with the outside world were, at best, tenuous. The islanders relied on the "St. Kilda mailboat." This consisted of a piece of wood shaped like a toy boat and hollowed out in the middle to hold a small bottle or tin, which contained the letter, instructions for the finder to post it and a penny for the stamp. The bottle was waterproofed with grease and battened down under a little wooden hatch which bore the inscription "Please Open" burnt into it with a hot wire. A float made of an inflated sheep's bladder with a small red flag tied to its mast was attached to the hull of the mailboat, and it was ready to sail. It was launched when the wind was in the northwest and more often than not it eventually turned up on the west coast of Scotland or, sometimes, Norway.

Because of its remoteness and the obliviousness of its inhabitants to the outside world, St. Kilda gained a reputation in the early 19th century for being a long-lost utopia. Accounts of the simplicity of the St. Kildans, stressing their charming naiveté and their primitive way of life—"Thus blest in primal innocence they live"—inevitably became confused with estimates of their moral worth. Few of its promoters had ever actually visited Hirta, but the romantic image of the "lone isle" caught the Victorian imagination.

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Cragsmen had unusually strong feet and ankles; toes were "almost prehensile."

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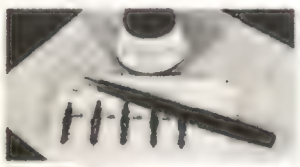

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to bring St. Kilda into line with the rest of civilization. Until now the islanders had always received visitors, who were regarded as great curiosities, with a mixture of fear and delight. They were unfailingly hospitable even though they knew that contact with outsiders would usually cause the community to be laid low with the "stranger's cough," a severe form of influenza to which the islanders had little immunity. Against the so-called benefits of civilization they had even less protection.

Although a few missionaries visited St. Kilda in the 18th century, it was not until the Reverend John MacDonald, the "Apostle of the North," arrived in 1822 that the islanders were first subjected to dogmatic religion. Because of the people's natural devoutness and superstitious character, the missionaries were able to set themselves up as their spiritual dictators without opposition. By their superior knowledge they gained an easy ascendancy over the hearts and minds of the islanders.

Some, like the Reverend Neil MacKenzie, who worked hard to raise the islanders' standard of living, were well-intentioned. He reorganized their farming, persuaded them to rebuild their village and instituted a sort of education. But when MacKenzie went away in 1844 he left behind a vacuum, a new dependency.

It was filled by the Reverend John MacKay, a zealous bigot. His sabbatarianism was so extreme that the St. Kildans, forced to attend three services on Sunday and lengthy prayer meetings most days of the week, were prevented from doing the vital work of the community. He banned singing and dancing, poetry, storytelling and all sport. For 24 long years the island labored under his oppressive yoke.

The St. Kildans did not try to resist. Even as they watched MacKay's tyranny bring life to a halt, they accepted it.

As contact with the mainland increased, the islanders, always a strong and healthy people, became susceptible to diseases previously unknown there. By the 20th century a general debilitating weakness had set in.

More than any other disease, *tetanus infantum* contributed to the decline of the community: it killed newborn children, usually within eight days. Throughout the late 18th and 19th centuries the disease was endemic, progressing until eight out of ten children died. By 1891 it had been brought under control, but the loss to the population was never made up. The emigration in the 1850s of 42 islanders to Australia may have sealed the community's fate.

Unable to adapt to the modern world,

August 28, 1930, the last 36 islanders prepare for next day's evacuation.

Their good cheer held until the island faded from sight; then came tears.

Boxes shown smaller than actual size. Clockwise, from far left: "Austrian Gold," Rosa Mundi, "Austrian Copper," Rose d'Amour, "Empress Josephine," Multiflora Carnea.

# The Empress Josephine's Rose Garden

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St. Kilda's economy collapsed. The demand for seabird products had dwindled and the islanders, demoralized and fatalistic, had run down their agriculture until they could not even produce enough food for their own needs. They could make a little money from tourists and by selling tweed. As their exports diminished their imports increased. They ceased to be self-supporting and came to rely more and more on the devitalizing charity of their MacLeod landlords and other concerned well-wishers.

Tourism had an equally malign effect. From being almost totally isolated the St. Kildans suddenly became overexposed. Visitors tended to be patronizing or scornful and the islanders lost respect for their ancient customs and rituals.

The "steamer season" soon became the most important part of the islanders' year. Once money—a relatively new idea in St. Kilda—had been introduced into their lives, its acquisition became a necessity. Their tastes grew more sophisticated. They started to import food and other essentials from outside and became even more dependent on communications with the mainland. Unfortunately, tourism was unreliable.

Communications with the mainland improved enough to destroy St. Kilda's independence, but not enough to bring the island into the swim of Scottish life. As early as 1875 evacuation of the island was considered as a solution, but the community refused. In 1913 the islanders, on the point of starvation and incapacitated by an influenza epidemic, were saved by the arrival of World War I, when a navy station was established on the island.

After the war ended and the navy base was disbanded, the community struggled on for another ten years, during which time many of the old people died and most of the young men left the island. The population fell from 73 in 1920 to 37 in 1928. Successive crop failures reduced life to a miserable level. In 1929 an epidemic coincided with the harvest: the St. Kildans were again threatened with famine. On May 10, 1930, they signed a petition asking to be removed.

The St. Kildans were settled on the mainland and given homes and jobs. But they lacked the determination to begin life afresh and the community gradually dispersed. The shock of leaving the island in some cases proved too severe and many of the old people died soon after the evacuation. Even the younger people stayed homesick all their lives.

Those still living retain their identity as St. Kildans, but regard the evacuation, for all the grief it caused, as inevitable. The community had been living on borrowed time since the turn of the century and it had long been clear that the advantages of the outside world would never come to St. Kilda, where life could go neither forward nor backward, for it had long since come to a stop.

Scottish National Trust has begun to restore St. Kilda's deserted homes and search for clues to its early history. Cottages were MacLeod gift in 1860.

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The painting, above, as it appears today in Rome. Tracing at upper right can be compared to smaller diagram, on which features of painting, such as crosshatched

*By Carolyn Murphy Beehler*

# Catacomb painting of trees may be an ancient star map

*At a time when astrology was banned by Roman civil law, it may have made sense to disguise stars as apples*

In the ancient catacombs of Rome, in burial chambers built for Priscilla, a noblewoman of Roman-Greek extraction, the walls and ceilings are adorned with paintings. In the course of doing historical research about Priscilla, I studied the pictures that recorded her family's heritage, faith and achievements.

A painting on the ceiling continued to disturb me even after I had returned home. Some months later it came to me: if you look at the very right-hand edge of the painting—better still, turn it so that edge is at the bottom—you will see a Madonna and Child. To the left of them, there is the figure of a man pointing overhead, to what appear to be fruit trees. The painting dates from a period (the first century A.D.) when the practice of astrology (then associated with astronomy) was illegal: civil law required that men leave their destinies to the emperor, while Christian teachings left those same destinies to God. Could it be that each individual fruit actually represented a star, and that the trees had been added to the "fruit" to disguise what was actually a map of the sky?

Priscilla's husband's name was Aquila, so the constellation Aquila (the Eagle) seemed a good place to start. And sure enough, a tracing of the fruit immediately above the painted figures matched the stars of that constellation in a modern sky map too well to be a coincidence.

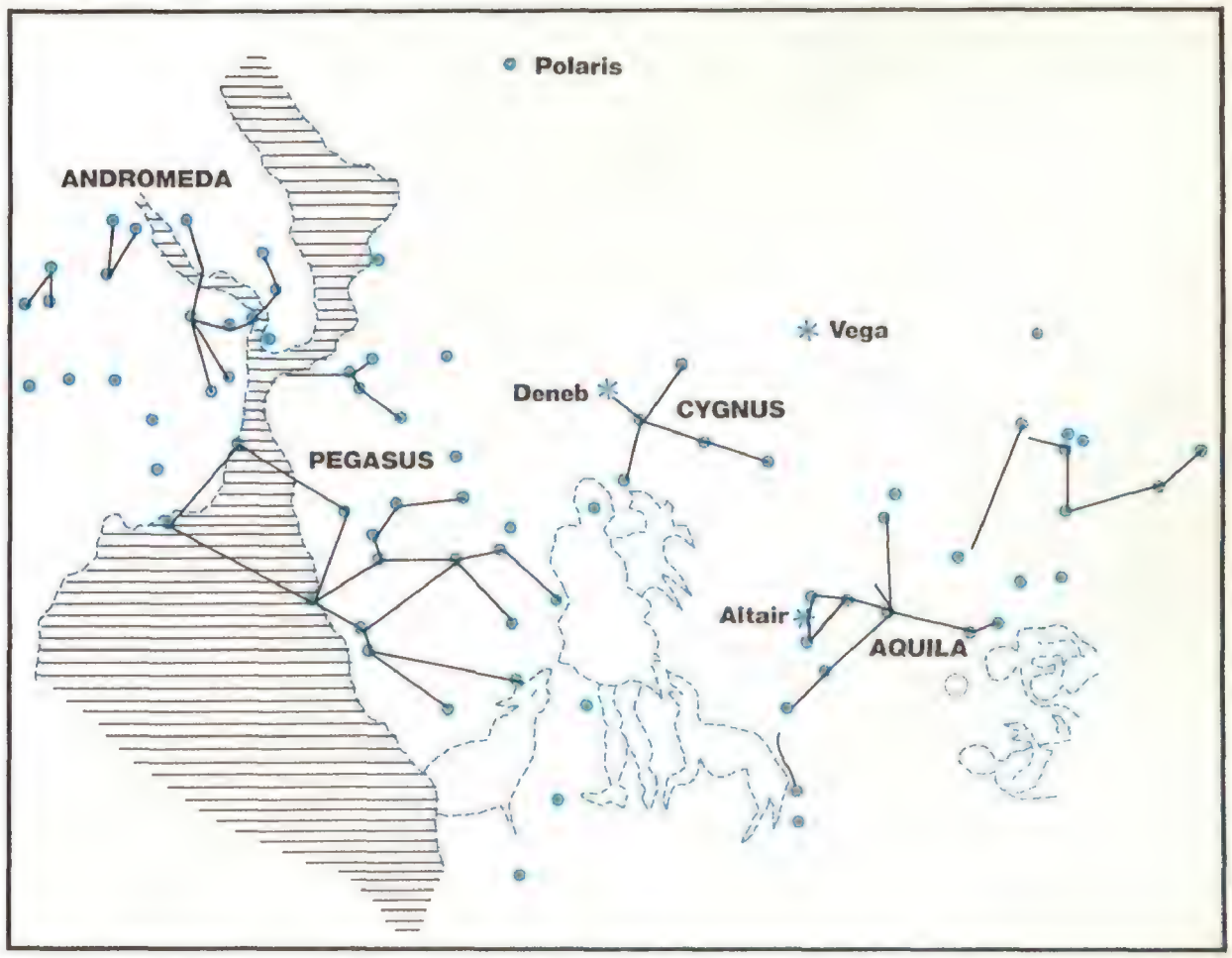
The approximate correspondence of the fruit in the painting to other stars in the real sky can be seen in the diagrams

missing area, are distorted to fit real sky. Polaris was added for orientation.

above and at right. The large drawing is a tracing of the painting and reproduces the distortions caused by the curve of the ceiling itself. The smaller drawing is an accurate map of the sky.

The figure to the left of the Madonna and Child appears to be pointing to a smudge of a star (shown as an open circle on the two drawings), a star that does not appear on modern star charts. The planet Venus was in that approximate position in the year 5 B.C., however, and many have suggested that it may have been the "Christmas Star."

Presumably the trees were added to avoid charges of practicing astrology. So what looks like a pastoral scene, with a Madonna and Child, may be one of the earliest star maps in existence.



# *Book reviews*

*Dragons: An Introduction to the Modern Infestation*
Pamela Wharton Blanpied
(Warner Books, $10)

*The Flight of Dragons*
Peter Dickinson
Illustrated by Wayne Anderson
(Harper & Row, $17.50)

Of all Man's symbols, one of the most enduring is the dragon. Both Occidental and Oriental cultures have ascribed great allegorical significance to the power of this vile beast. The subjugation of dragons, synonymous with legendary heroism, has come to symbolize the triumph of good over evil, of Man over the hostile forces of nature. Jason did it; so did St. George, St. Michael the Archangel, Lancelot and Beowulf. Yahweh slew Leviathan and Chinese royal families took the dragon as a symbol of imperial power.

If the object of myth is to lend coherence to the mysteries of life, then we must study the crucial role of the firedrake. For those whose verminology is weak, these books will enrich your meager hoard of dragon lore.

*Dragons: An Introduction to the Modern Infestation* is a lively, witty satire of those anthropological studies that reduce human (and other animal) habits to infuriating abstractions. Basing her "research" on the work of the Dragon Study Group and the New Zealand School of Dragon Studies, the author puts together the derring-dos and don'ts of dragons.

Illustration from *The Flight of Dragons.*

With a brusque precision that would do Margaret Mead proud, Blanpied sets forth the latest findings in dragonology. Studies such as "The Dragon, Non-Dragon Interface" present a detailed and entertaining account of the killing and eating habits of dragons, right down to which control group eats only the tenderloin of victimized cattle.

The creatures that the "researchers" observe are "intelligent, cunning, and,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The National Air and Space Museum has completed production of the seventh poster in the Aviation Relic Series. The Albatros D. Va, a World War I fighter, has been completely restored and is exhibited in the World War I Gallery of the Museum. The original fabric, removed from the aircraft during restoration, has been cut into squares and is available to the public mounted on handsome 15" X 20" posters suitable for framing.

Five other posters in the series are still available. These are the Douglas World Cruiser, the Curtiss NC-4, the Fokker T-2, the Vin Fiz, and the Lockheed Vega 5B. The posters are produced in limited editions determined by the quantity of fabric available. Their historic value combined with the limited number make them unique collector's items.

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occasionally, playful." The author constructs a noble case for the modern-day existence of dragons and the refinements of their evolution. "They have the ability to camouflage themselves in the mime." Distinctively protean, her dragons assume postures remarkably similar to the world around them, such as deserts and ski slopes. What they can't imitate, they pillage or ravish. This is known as the "Lust of the Rapine Worms."

No mean mimic herself, Blanpied manages to make the dragons anthropomorphize before our eyes. There is Vlad, for example, whose dialects range from imitating the typewriter to Cockney and street Portuguese. His finest moment is a "hilarious recital of a soccer match crowd after Flavio Jibáro has been red-carded." Vlad reminds me of Thurber's Duke of Coffin Castle in *The Thirteen Clocks* who excuses his evil ways with "we all have flaws and mine is being wicked."

Effective works of satire, like those of fantasy, must have their own integrity. If the imagined world is not constructed with precision and coherence, it falls apart. Blanpied's book succeeds because her subject matter, outrageous as it might appear, is skillfully portrayed.

Like Blanpied, Peter Dickinson is determined to make dragons credible. Dickinson, a masterly writer of suspense novels and children's books, attempts to "prove" the methods and patterns of dragon flight in the most scholarly and delightful way. Actually an anthology of dragon lore, *The Flight of Dragons* is a superbly illustrated, beautifully crafted work for any age.

Dickinson contends that he can "put together a coherent theory [that dragons existed] which is at least as probable as the theory that dragons are completely legendary." He certainly succeeds if one will temper skepticism with enjoyment.

Drawing on references from Pliny and Homer to C. S. Lewis and J. R. R. Tolkien, Dickinson painstakingly weaves his theories on how dragons fly, where they come from and where they go. His theory of flight is not unconvincing, once you get used to it: dragons can fly because, like the *Hindenburg*, they are very big, with room for a great deal of gas. They are said to breathe fire because it is "part of their specialised mode of flight."

Dickinson's catalog of dragon evidence includes a meticulously annotated map of sightings in Great Britain, a chart of the comparative evolution of dragons, Man and dinosaurs (including the pseudo-dragon and mytho-dragon), and some of the most magnificent illustrations I have ever seen.

In conclusion, Dickinson writes: "The dragons live. Inside us." His book is a glorious testimony to this awful truth.

*—Jill Merrill*
Washington writer and critic

*On the Road with John James Audubon*
Mary Durant and Michael Harwood
(Dodd, Mead, $19.95)

John James Audubon, French-reared fugitive from Napoleon's conscription, failed merchant, sometime dance instructor and portrait painter, woodsman, pioneer American naturalist and, ultimately, world-renowned painter of feathered (and quadruped) wildlife, was the most peripatetic of men. For more than 30 years he tramped forests and meadows,


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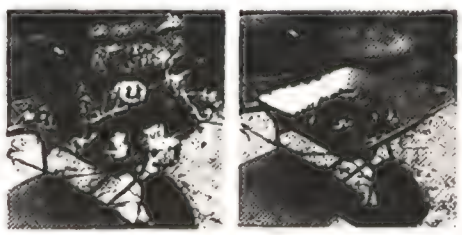

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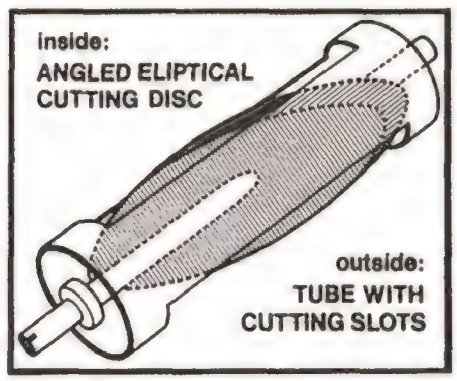


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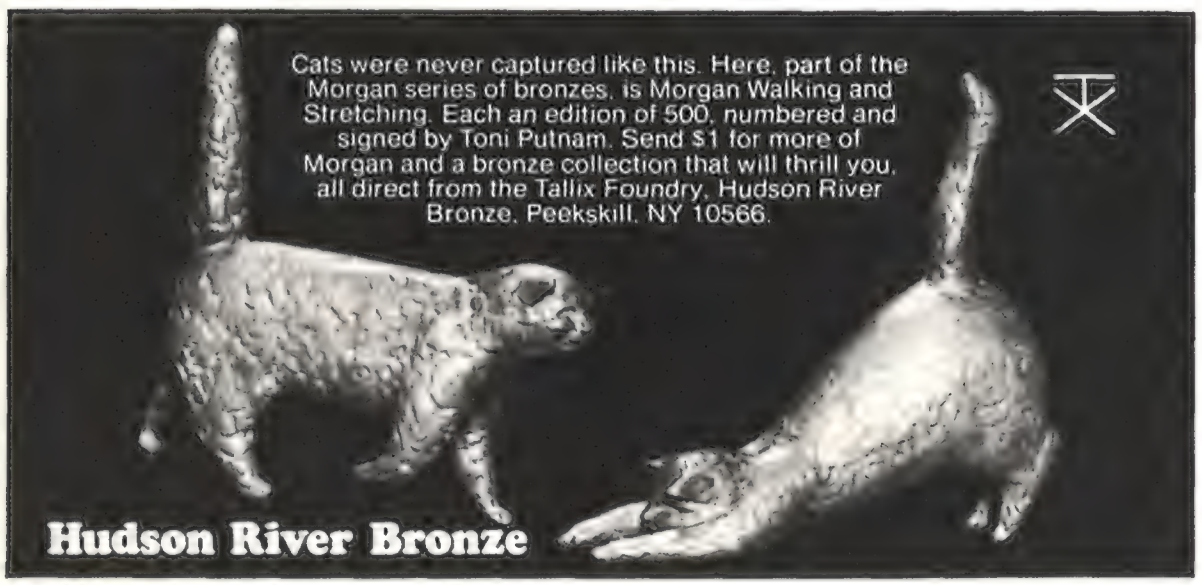
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scoured marshes and bayous, navigated rivers, in a never-ending search for new specimens to observe, draw and paint. The Ohio, Missouri and Mississippi river basins, the New Jersey and South Carolina coasts, Kentucky, the Florida Keys, the Gulf Coast, the Montana and Dakota plains, even Labrador—he explored them all, on foot, horseback and by riverboat, indefatigable. And all the while he kept a journal, carefully recording where he went, what he saw and whom he met.

Now, Mary Durant and Michael Harwood, husband and wife, amateur naturalists, professional writers, have retraced Audubon's steps. Traveling by family car, living in a tent most of the way, they covered some 35,000 miles in 13 months. This book, which includes 130 black-and-white photographs, is an account of their pleasantly obsessive journey. Intermingling their separately recorded observations with snippets from Audubon's own journals, they have produced a work that is part travel book, part biography and part ode to natural—especially ornithological—phenomena.

Durant and Harwood set out to "drift around eastern North America, writing about birds and flowers and scenery," and to discover how much of Audubon's America remained. But before long they found that Audubon "imposed himself on the project more or less in person—not simply as the guide we wanted but as a quirky traveling companion." From then on, they became intent on capturing the essence of this complex man with whom they had long been infatuated, in whose lore they were steeped, but whose core had somehow always eluded them.

As a travel account and paean to nature the book succeeds marvelously well. Durant and Harwood have a keen eye and a good ear.

Harwood: "We saw two octogenarians approaching each other on the sidewalk. She was black, crooked-legged, crooked-backed; he was white, unshaven, seedy-looking. 'How are you?' she asked offhandedly as they passed. 'I'm kickin',' he said, 'but not much else.' 'Yeah,' she said—gone by him now, rolling stiffly along, her back to him, 'me too.' That, remarked Mary, says it for all these Illinois towns along the nether reaches of the Ohio. Kickin', but not much else."

Durant: "We seem to have wandered into a Japanese painting. Forests of tall tufted pines. A small green lake curving

against a cragged hillside. A narrow point of land bending into the lake. At the end of the point, a pair of tall pines, just so, and a pair of white Muscovy ducks. One stands, one roosts, just so. And last night, out of the piney woods on the steep hillside across the lake, a full moon rose, just so, in perfect balance with the curve of the water, the point, the ducks."

The style of both authors is genial, unlabored, sometimes lyrical, always unpretentious, and often so similar in tone that without consulting the headings it is difficult to tell which is responsible for a particular entry (the hallmark of a long-married writing couple?).

Especially satisfying is an account of a five-day journey on the Mississippi on board a towboat wrestling a quarter-mile of barges downriver, and another of a visit to Labrador (described by Audubon as "so wild and grand" that it is "enough to interest anyone in its wonderful dreariness"). With their pinpoint characterizations and picture-sharp renderings of landscape and fauna, these set pieces are models of good descriptive writing.

The book is less successful in capturing Audubon the man. We learn a great deal about his life and work, but as Harwood himself admits in frustration, the naturalist's essential character is difficult to grasp; it tends to drift in and out of focus. John James Audubon, quixotic, charming, driven, remains something of a mystery to the end.

And how much of Audubon's America survives? Both more and less than we might have thought. "We found the inevitable: towns grown into urban sprawl, and roadless wilderness now laced with highways. But we also discovered vast tracts of wild country much as it was in Audubon's day, as well as many places he had known as busy communities now vanished from the map and often from local memory—river towns turned to dust and grown over, frontier settlements gone back to prairie. America has not been cemented over after all."

Durant and Harwood have written a book that is obviously "must" reading for confirmed Audubonians; but there is much in it to instruct, delight and even surprise those of us whose interest in Audubon may be more limited, but who share the authors' fascination with the changing aspect of the land we inhabit.
*—Albert Meisel*
Head, public programs, National Archives


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*Jupiter's Travels*
Ted Simon
(Doubleday & Company, Inc. $14)

"It is no trick to go around the world these days," Ted Simon observes at the outset of *Jupiter's Travels*. "You can pay a lot of money and fly around it nonstop in less than forty-eight hours, but to know it, to smell it and feel it between your toes you have to crawl."

So on a rainy night in October of 1973 Ted Simon rode down Grays Inn Road in London and embarked on a 63,400-mile crawl aboard a Triumph 500-cc motorcycle. The trip lasted almost four years.

In Asia, near the end of Simon's trip, an Indian took his hand. "You have a very determined soul. This is also reflected in your mind. You are Jupiter."

He wasn't entirely sure why he was making the trip, and as he struggled through some 40 countries in Africa, South and North America, Australia, India, Western Asia and back to Europe, he kept exploring himself for meanings: *"Why you? Why were you chosen to ride through the desert while other men are going home from the office?"*

This finely written narrative, sensitive and funny, thoughtful and adventurous, is reason enough for the journey. *Jupiter's Travels* is good adventure. It is also an unusual account of how the mind writhes and stretches to accommodate new experiences—fear and wonder, hardship and languor, brutality and unexpected kindness, not to mention appalling roads.

Simon, a British journalist, is no swashbuckler. He barely knew how to ride a motorbike before he set off and he rolled along with a mixture of engaging naiveté and nameless dread.

*"Just look at me,"* he chortles, camping out in Libya. *"Isn't this too bloody fantastic for words? It's me here, not Lawrence of Arabia or Rudolf Valentino or Rommel and the Afrika Korps. Me, and this little machine, we made it here."* But in Tanzania, for no evident reason, "Fear simply roared up and engulfed me in a waking nightmare," and his nameless, subconscious tremors didn't dissipate until he reached Argentina.

Simon has a good, selective eye (despite an accident that almost blinded him in Malaysia) and he gives us the benefit of it—red and white Ethiopian termite mounds "like an outdoor exhibition of Henry Moore's statues," downtrodden Indians in Peru whose bright weaving "seemed in direct contradiction to their lives, as though the inspiration for it had died centuries before and the fingers were simply reproducing it by some freak genetic mutation."

He has good sensibilities, too. When he

drinks tea with four Sudanese "Fuzzie-wuzzies" he realizes he could never make contact with them in a London pub—"They could never be there what they are here. They would be made small by the complexities, the paraphernalia that we have added to our lives, just as we are though we have learned to pretend otherwise." In Rhodesia he foresees that time is running out for the White Tribe, particularly for racists like the Afrikaner farmer who weighs each new laborer and measures his food according to his weight.

He introduces us to a large and mixed bag of characters: a bishop in Kenya who has given up thinking; a one-legged crocodile hunter in Australia; heroin-peddling trishaw drivers in Penang; the *Policia Federal* in Brazil, where he was arrested; commune dwellers in California, where he fell in love; the jumbled humanity of India, a country that plunged him into malaise, exhaustion, fascination and near ecstasy.

It was in Brazil that he came up with the big questions—"How poor is poverty? How rich is rich? Should priests tend bodies or souls? . . . Can a democracy function with an illiterate population? What kind of aid helps, and what kind is useless, and what kind corrupts? . . . How can I or anyone possibly live a good life amidst all this squalor and humidity and decay and indifference? . . . What is there to lift up the heart and the spirit?"

Simon doesn't have the answers, of course, but he gives us some of the satisfactions of his trip. "People who thought of my journey as a physical ordeal or an act of courage, like single-handed yachting, missed the point," he writes. "The goal was comprehension, and the only way to comprehend the world was by making myself vulnerable to it so that it could change me."

—*David Lancashire*
*The Globe and Mail,* Toronto

*Diana & Nikon: Essays on the Aesthetic of Photography*
Janet Malcolm
(David R. Godine, $13.95)

For the title of her book on photography, Janet Malcolm has pulled a switch on Roman mythology. The traditional bow and arrow in the hands of Diana, goddess of the hunt, has been replaced symbolically by a 35-millimeter camera. It is an appropriate exchange for our times,


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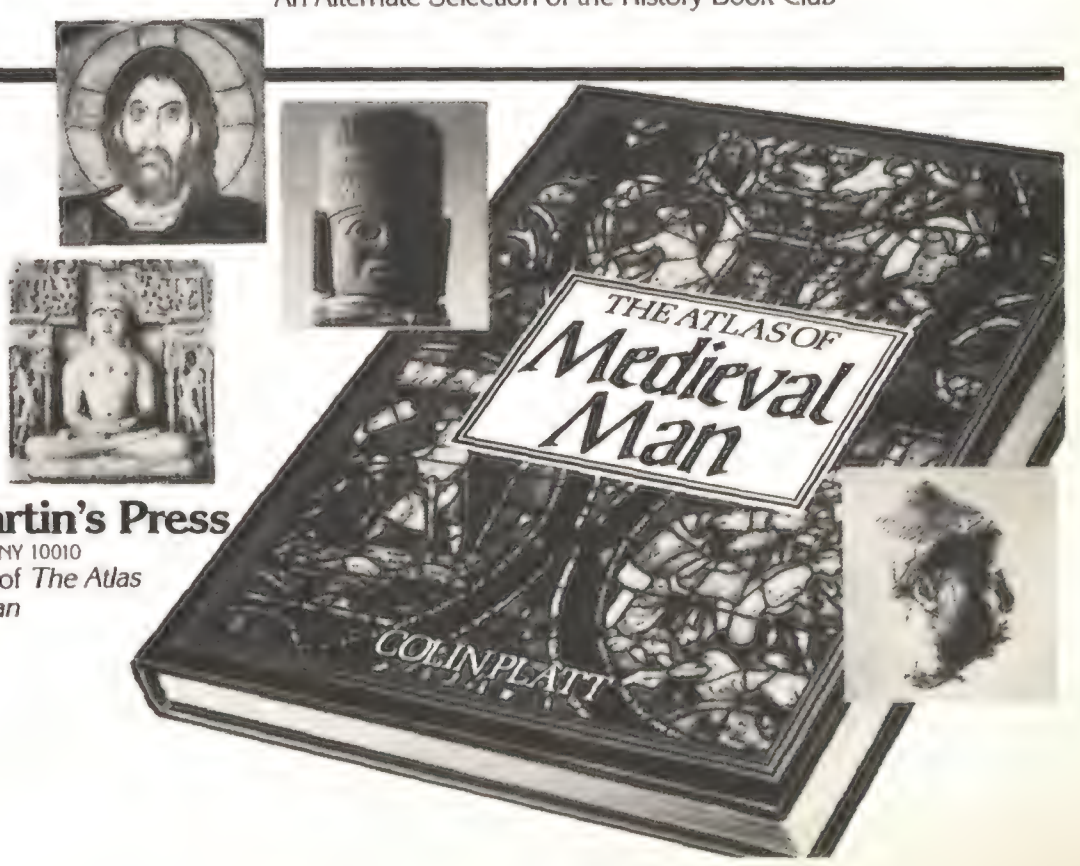


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since people everywhere are loaded down with photographic equipment, stalking their prey, shooting snapshots, capturing events on film, bagging "art."

The purpose of Malcolm's own selective hunt is the nature of modern photography itself, as presented in growing numbers of art galleries specializing in photography, in museums and publications. Ten of the 11 essays were first printed in *The New Yorker.*

The images are rendered with a fine facility for language, so that Alfred Stieglitz' view of the steerage section of an ocean liner and Richard Avedon's high-fashion model posing with elephants fill the pages with a precise presence just through exemplary telling of details.

In this way, we are taken through an Edward Weston retrospective, from bell peppers to nudes. Alfred Stieglitz' career is examined in two essays, as though turning over the same stone twice and finding something different each time.

Similarly, room-by-room reviews of a gallery show and a museum exhibition reveal Richard Avedon's electrically charged ambivalence toward his fashion shots, which are examined next to the savage pictures of his father's terminal illness and the frontal, unfashionable portraits in the manner of pre-World War II photographs by August Sander, who set out to record the physical types of the German nation.

Description is only half of looking, though, and Malcolm also examines these pictures for evidence of the culture they came from and the culture they in turn create. So it is not surprising that halfway through the essays she begins asking questions about how and what a photographer sees through the lens of a camera. She delves into the long-standing relationship of painting to film, explores the tension between fine art and utilitarian traditions in photography, and sallies bravely forth to define modernism in photography.

These are not new topics, but Janet Malcolm's take on them is fresh and frank. ". . . Scratch a great photograph [and] you find two things: a painting *and* a photograph," she writes in the essay "Two Roads, One Destination." She gently pokes through snapshots taken by amateur photographers and holds them up to the work of knowledgeable artists such as Walker Evans and Garry Winogrand. Her conclusion is simple: "Pho-

tography went modernist not, as has been supposed, when it began to imitate modern abstract art but when it began to study snapshots."

Malcolm's approach is that of a woman of letters, a probing mind coming up against solid evidence of a new cultural phenomenon and grabbing the tools she has at hand to define it. While her starting point is with the esthetic line laid down by John Szarkowski, director of the photography department of the Museum of Modern Art in New York, her references are apt to be literary —Henry James, T. S. Eliot and Jean Genet. Her point of view rests somewhere outside the insider's place in contemporary photography and her sounding board is more likely to be the writings of social historian John A. Kouwenhoven (author of *Made in America*) than the guru of young photographers today, the late German critic Walter Benjamin, whose "Art in the Age of Mechanical Reproduction" is often quoted by them.

But this distance gives the author's words clarity and common sense. The single lapse from this good taste occurs when Malcolm describes Eve Sonneman's serial photographs in adjectives too close to a cloying press release, falling into the mistake of judging them simply by what the photographer intended them to be, not by what they are.

The method of making the photographic print from a lens, light and chemicals is only 141 years old, and for most of that time photography has operated without an esthetic. In the past two decades, several writers have taken on the task of forming esthetic guideposts for a fast-changing medium. Critic Max Kozloff has written brilliantly for *The Nation* on painting and photography, and Susan Sontag's impressive book on photography and popular culture was published three years ago. Both writers tend to march into the subject in the manner of field commanders.

Janet Malcolm, on the other hand, remains as a solitary foot soldier, finding her own way without much reference to previous critiques beyond the writings of the photographers she looks at. By turning and questioning, she builds from the particular to the punch line, gradually shaping her own still-evolving ideas about the meaning of photography.

—*Mimi Crossley*
Houston critic


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**Antarctica**—December 31, 1980-January 20, 1981: Prominent lecturers make this a rewarding expedition to a powerful continent. Cruise aboard the *World Discoverer* from Punta Arenas, Chile, to the Falkland Islands, then down to Antarctica.

Coming in February: **New Zealand.**

* Indicates optional predeparture course.

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# in Washington

### Selected Studies Seminars

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**Tibet: Lost Horizons**—Sept. 28-Oct. 3: A cultural history of a uniquely rich civilization. Includes tours of the Freer Gallery of Art and the best private collection of Tibetan art in the U.S.

**China: A Cultural History**—Oct. 5-10: Prehistory to the enigmas of today, with emphasis on the intellectual and artistic traditions and the great philosophies and religions. Includes recent films and tours of the Freer Gallery of Art.

**Historic House Preservation**—Oct. 19-24: Experts advise on how to work with architects, contractors and other professionals; explain mistakes to avoid and how to save money; and lead tours of lovely Georgetown, Old Town Alexandria, as well as famous country estates.

**Aircraft Restoration: How To**—Oct. 26-30: Internationally known craftsmen who have restored the famous masterpieces of aviation in the National Air and Space Museum offer workshops at Silver Hill on the many various techniques used.

**Flemish and Dutch Painting in the 17th Century**—Nov. 9-14: Princes and patriots with masterworks by Rembrandt, Hals, Vermeer, Rubens, Van Dyck and others. Lectures and tours of the National Gallery of Art with Bill Kloss.

**World War II Aircraft**—Nov. 16-21: Guest experts and the outstanding aeronautical staff of NASM offer new insights as they discuss how the major air forces of the world came into being and how quantum jumps in aviation production and performance were achieved. Includes tours of many of the only surviving World War II planes.

**Genealogical Research**—Nov. 16-21: Taught by the "dean of American genealogy," Milton Rubincam, Marilyn Duncan and other leading authorities, participants learn how to conduct research in major genealogical repositories such as the National Archives, Library of Congress and the DAR Library.

**357-2477 (tours) or (202) 357-2475 (seminars).**

# *Smithsonian highlights*

It's Howdy Doody time at the Museum of History and Technology. Also time for Kermit the Frog, Charlie McCarthy and pal Mortimer Snerd, who join some 20 colleagues in a new summer show, *Puppets and Things on Strings*. The June 8 opening coincides with the World Puppetry Festival at the Kennedy Center, June 8-16. Also on the Smithsonian calendar are several other "puppet shows" (below) at the Hirshhorn, Renwick, Museum of Natural History and the Museum of African Art (MAA).

On the first of June the MAA opens a major exhibit of some 450 works from West and Central Africa, including masks, figures, jewelry and textiles. *Selections from the Permanent Collection* marks the museum's official merger with the Smithsonian Institution.

## Special June events

**Cooper-Hewitt Museum** (New York)
*Resorts of the Catskills* (June 10-August 17)—Works show architecture and social life of American resort.
*Hair* (June 10-August 17)—Entertaining and informative history of hair styles.
*Americana Day* (June 7, noon-5 P.M.)—Craftsmen and artisans at work in the Carnegie Garden.

**Freer Gallery of Art**
*Thomas Wilmer Dewing* (opens mid-June)—Paintings and drawings by American whose favorite subject was beautiful and elegant women.
*Chinese Calligraphy* (through November 10)—Scrolls and rubbings, including some rare works by great masters, represent Freer's growing collection of this treasured art form (p. 175).
*Korean Art*—New exhibit includes ceramics, paintings, metalwork.

**Air and Space Museum**
*Planet Earth* (June 7, 9 A.M.)—Monthly sky lecture compares Earth with other planets, Albert Einstein Spacearium.
*Astronomers, Pyramids and Priests* (June 18, 7:30 P.M.)—Griffith Observatory Director Edwin C. Krupp discusses astronomy in early Egypt.

**National Portrait Gallery**
*Zelda and Scott: The Beautiful and Damned* (June 5-December 1)—The world of the Fitzgeralds (below), including Zelda's own works and original cover for *The Great Gatsby*.
*American Portrait Drawings* (through August 3)—Some 95 works.

**Hirshhorn Museum & Sculpture Garden**
*Brancusi as Photographer* (June 4-August 10)—Some 70 prints taken by sculptor Constantin Brancusi (1876-1957).
*Alexandra Exter: Marionettes and Theatrical Designs* (through July 6).
*The Fifties: Aspects of Painting in New York* (through Sept. 21)—Works by 33 artists illustrate this fruitful era.

**Museum of African Art**
*Selections from the Permanent Collection* (June 1-October 19)—Works chosen from 8,000 objects in the collection.
*African Puppetry* (June 6-September 30)—Exhibit features puppets used for important social events in West Africa, puppet stage from Mali and video-taped performance.

**Museum of Natural History** (MNH)
*The Conquest of Land*—New hall illustrates emergence of life.
*The Story of Amar Singh* (June 14, noon)—Marionettes from Rajasthan, India.
*Leather Shadow Puppets from Karnataka* (June 14, 2 P.M.)—Indian puppets enact stories from the Hindu epics.
*Illustrated Lectures* (Fridays, noon)—"The Chesapeake Bay Center for Environmental Studies," June 6; "Endangered and Protected Plants of Mid-Atlantic and Coastal Dune Areas," June 13; "Conservation Strategies," June 20; "Preserving the Chesapeake Bay Heritage," June 27.

**National Collection of Fine Arts**
*Across the Nation: Fine Art for Federal Buildings, 1972-1979* (June 4-September 1)—Works commissioned by the government and recently transferred to NCFA.
*Violet Oakley: Art and Decoration* (June 27-September 14)—Drawings, paintings by this American muralist (1874-1961).

**Renwick Gallery**
*New Glass* (through August 24)—More than 250 objects—goblets, vases, sculpture—from 28 countries.
*Traditional Marionettes in French Belgium Today* (through July 27).
*Costumes from the Arab World* (through July 27)—Distinctive collection.
*Belgian Lace* (through November 11)—Skirts, parasols, collars and other samples.

National Portrait Gallery: Gift of Scottie Fitzgerald Smith

Harrison Fisher's portraits of Zelda and F. Scott Fitzgerald, 1927, join photographs and other memorabilia of famous couple in Portrait Gallery exhibit.

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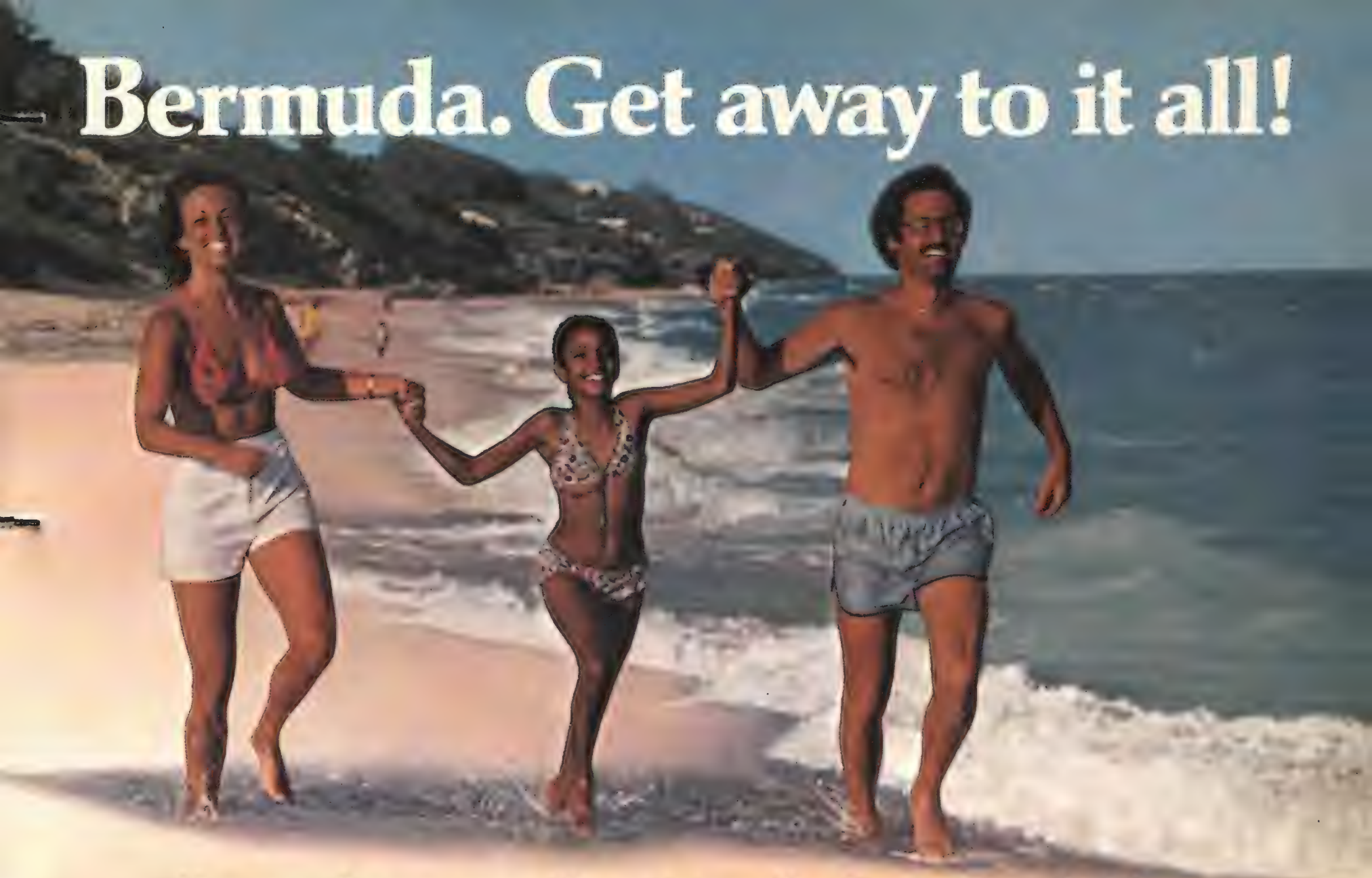

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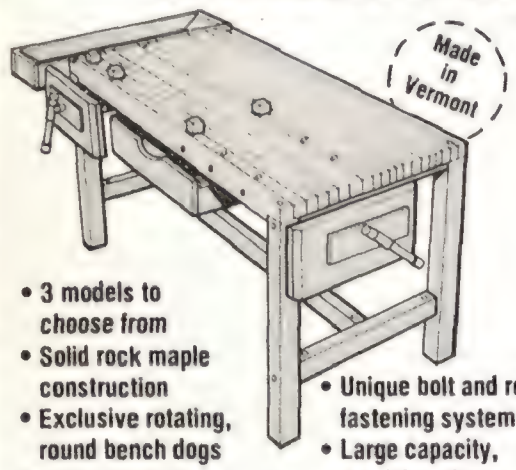


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Math art at MHT: *Construction of Heptagon* by Crockett Johnson, 1975.

**Museum of History & Technology** (MHT)
*Theorems in Color* (June 20-September 12)—Paintings by Crockett Johnson based on classical math theorems (above).
*Puppets and Things on Strings* (June 8-September 1)—Some famous entertainers go on exhibit.

## Smithsonian events

Special events in June are listed below. For tickets call 202-357-3030.
*Seventh Annual Open Boomerang Festival*—Try out "the thinking man's Frisbee": special events, June 7, 14.
*The Splendor and Legend of Indian Textiles* (June 25, 6 P.M., MHT)—Lecture by artist Pilloo R. Pochkhanawala.
*Forensic Anthropology: Testimony from the Corpse* (June 5, 8 P.M., MNH)—Lawrence Angel, curator of physical anthropology, talks about identifying human remains and his work with the FBI.
*Satellite Communication: New Wave Technology* (June 19, 8 P.M., MNH)—Talk by expert Clifford Block.
*John Canaday on the Artist, the Critic, and the Public* (June 18, 6:30 P.M., MHT).
*The Post-Impressionists* (June 24, 2 and 6:30 P.M., MNH)—Talk by Theodore Reff, Columbia art history professor.

## Radio Smithsonian

This music and conversation program is broadcast weekly on approximately 65 stations across the country.
*Behind American Art*—A look at the Archives of American Art; *Carved in Stone*—The strange Bronze Age carvings in Sweden (week of June 1).
*Voices of the Civil Rights Movement* (week of June 8).
*Faster than Sound*—Charles E. "Chuck" Yeager looks back at his career as a jet pilot; *Off the Pedestal*—The "Women's Pavilion" at the 1893 Columbian Exposition (week of June 15).
*From Capetown to Cairo: 1932*—Two women's journey through Africa almost 50 years ago; *Interpreting History*—MHT Director Roger Kennedy reflects on the museum (week of June 22).
*The Astaire Factor*—Pianist John Eaton explores the music composed for Fred Astaire (week of June 29).

## Membership benefits when visiting the Smithsonian

The Associates Reception Desk, in the castle, is open 10 A.M.-4 P.M. daily for registration and information materials. Ask about orientation slide-talk.

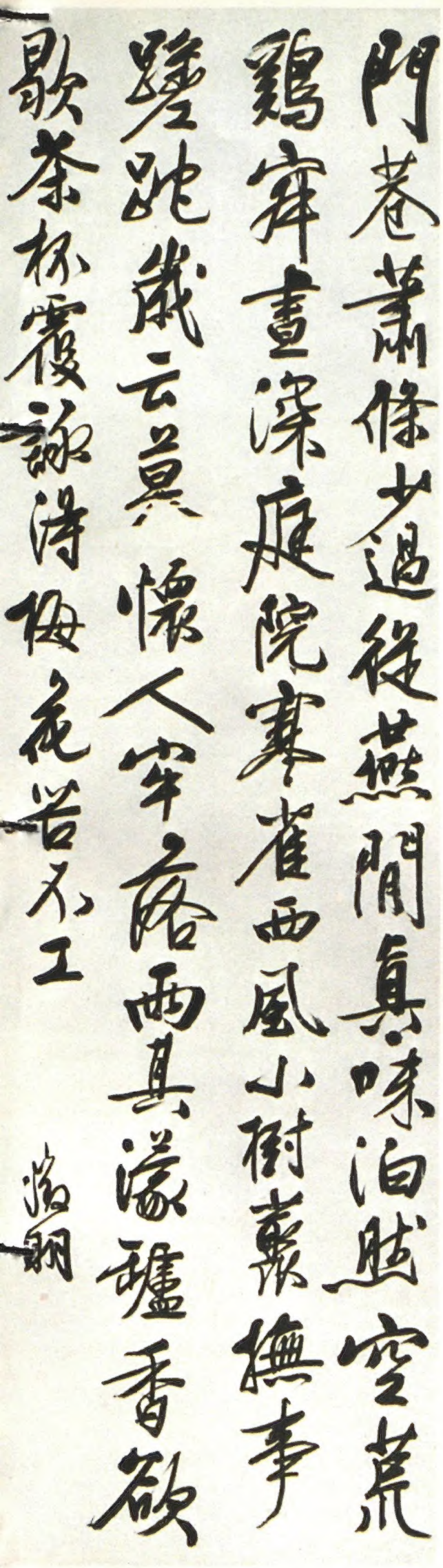
The Associates Lounge in the castle, a quiet place to relax, is open extended hours through Labor Day from 10 A.M. to 9 P.M. daily.

The Members' Dining Room, "The Court," in the Museum of Natural History is open Monday-Friday, lunch 11 A.M.-4 P.M.) and dinner (4:30-7:30 P.M.); weekends, breakfast (9-11 A.M.), brunch (11 A.M.-4 P.M.) and dinner (4:30-7:30 P.M.). Enter via Constitution Avenue for breakfast.

For previsit information, send postcard or phone Associates Reception Center, Smithsonian Institution, Washington, D.C. 20560 (202-357-2700 or, for hearing impaired, TTY 202-357-1729). Allow two weeks for receipt.

## Smithsonian Institution Traveling Exhibition Service

SITES circulates exhibitions to hundreds of cities outside Washington, D.C. To sponsor a show in your community, write to Eileen Harakal, SITES, Smithsonian Institution, Washington, D.C. 20560. Here are some June exhibits:
**Evansville, Indiana** (June 14-July 13)—*Flying Fantasies: Butterflies and Moths,* Evansville Museum of Art and Science.
**Davenport, Iowa** (May 31-June 29)—*Images of Earth from Space,* Putnam Museum.
**Patterson, Louisiana** (May 31-June 29)—*Audiences of the Moon,* Wedell-Williams Memorial Aviation Museum.
**Kalamazoo** (June 21-July 20)—*American Drawings II,* Kalamazoo Institute of Arts.
**Canton, New York** (June 14-July 13)—*Suiting Everyone,* The St. Lawrence County Historical Association.
**Springville, Utah** (May 31-June 29)—*Quintessential Quilts,* Springville Museum of Art.



Wen Cheng-ming executed this 12-foot, palace-sized scroll in "running" script.

## *Calligraphy at the Freer*

The old adage that it's not so much what you say as how you say it seems particularly appropriate to the fine art of Chinese calligraphy. According to connoisseurs, appreciation lies not in content but in the shape, stroke and balance of each character and the relationships of the characters to the work as a whole.

"Knowing the stroke order and other rules of calligraphy helps you appreciate the work. Knowing the meaning may help you become more involved," says Freer Gallery curator Dr. Shen Fu, a calligrapher himself. "But you certainly are able to appreciate calligraphy without understanding the content."

The difficulties in understanding calligraphy, including the inevitable urge to read it, may account for delay in Western appreciation of the art. This same urge prompted the translation below of a scroll (left) in the Freer's *Chinese Calligraphy* exhibit through November 10.

Calligraphy, considered by the Chinese as their supreme artistic achievement, began more than 3,000 years ago. The earliest characters appeared on oracle bones and in bronze inscriptions. These were gradually altered by calligraphers who creatively exploited the flexible writing brush. By the fourth century, the basic script forms were established.

In calligraphy, greatness is measured by the artist's ability to work within the traditional structure yet make an individual statement—with subtle brush strokes, choice of content or fresh interpretation of a character. Connoisseurs tell us that if you look carefully and with knowledge, you may be able to see more than meets the eye.

*"On Living at Leisure at Year's End"*
By Wen Cheng-ming (1470-1559)
(translation by Jonathan Chaves)

The street before my door is desolate;
few visitors pass by.
The True Flavor of leisure
seems a tranquil void.
An untimely rooster crows during the
day, somewhere deep among the
courtyards;
Cold sparrows, buffeted by the west wind,
huddle in little trees.
Affairs seem to have gone awry
as the year draws to a close;
I long for friends in the loneliness,
beneath a misty rain.
The incense is running out in the brazier,
the teacups are overturned;
I write poems on plum blossoms,
but I'm afraid they're not well written.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*By Richard Wolkomir*

# *Political insult ain't what it used to be*

Whatever happened to the fine old art of political insult? Maybe it's because they've been squeezed through too many TV tubes, but don't modern politicians seem a bit bland?

With no polls, PR wizards or slick video ads to rely on, candidates used to go into combat armed with razor wits and luxuriant vocabularies. Maledictions sizzled through the air like rockets. And a sharpened slur could be lethal.

For instance: the eloquent John Randolph, of Virginia, was not fond of his fellow Congressman, Henry Clay, of Kentucky. One day, brimming with bile, Randolph shot off this description of Clay: "This being, so brilliant yet so corrupt, which, like a rotten mackerel by moonlight, shined and stunk."

Slapped with a sentence like that, a man might forever smell faintly of fish. That sort of invective led one foreign observer of our political style to note that Americans were the only people he knew to pass from barbarism to decadence without experiencing civilization.

Disgusted with a campaigner who was trampling all over the facts, a reporter told fellow newsman Heywood Broun, "He's murdering the truth!" "Don't worry," Broun replied. "He'll never get close enough to do it any harm." New York attorney Roscoe Conkling, asked to campaign for Presidential candidate James G. Blaine, replied, "I do not engage in criminal practice."

It was Theodore Roosevelt who inspired one of the neatest political barbs. Teddy had just left on a much-publicized lion-hunting safari in Africa when the following notice appeared on a wall at the New York Stock Exchange: "Wall Street expects every lion to do his duty."

Politicians weren't the only ones with sharp tongues. Hecklers, too, knew the potency of a booby-trapped sentence, as William Jennings Bryan discovered. During a political speech he unleashed his famous oratorical ability, crying, "I wish I had the wings of a bird to fly to every village and hamlet in America to tell the people about this silver question." Cried a voice from the audience, "You'd be shot for a goose before you've flown a mile."

Of course, politicians developed excellent defenses against such snipers. One crack shot, when it came to gunning down hecklers, was Al Smith. During one of his campaigns for governor of New York, just as he began an address, a voice from the crowd bawled out: "Tell us all you know, Al—it won't take long." "I'll tell 'em all we *both* know," snapped Smith. "It won't take any longer."

Yesterday's politicians reserved their highest caliber insults for each other. When Bryan was elected to Congress in 1891, he was dubbed the "Boy Orator of the Platte." Senator Joseph Foraker, of Ohio, announced that like the Platte River, in Bryan's home state of Nebraska, Bryan was "only six inches deep but six miles wide at the mouth."

During the Presidential campaign of 1940, Harold Ickes, the sharp-tongued Secretary of the Interior, called Republican candidate Wendell Willkie "a simple barefoot Wall Street lawyer." And when the youthful Thomas E. Dewey announced in 1944 that he was entering the Presidential race on the Republican ticket, Ickes noted that "Mr. Dewey has tossed his diapers into the ring."

Calvin Coolidge had an even drier New England wit. Once eager to impress the President, a speaker at a party function went on and on and on. "How did you like my speech, Mr. President?" he asked Coolidge later. "Not bad," said Cal, "but you missed a nice opportunity." "What was that?" asked the man. "The opportunity to sit down about twenty minutes earlier," Coolidge said.

But Coolidge's taciturnity made him the butt of many barbed comments himself. Clarence Darrow called him "the greatest man who ever came out of Plymouth Corner, Vermont." And when Dorothy Parker was told that Calvin Coolidge was dead, she said: "How can they tell?"

Lincoln, considered our greatest President, was also one of our great political wits. Usually his humor took the form of kindly parables, but he could be as sharp as an Illinois ax when provoked.

Of a lawyer he didn't like, Lincoln once said, "He can compress the most words into the smallest ideas better than any man I ever met." And, during the early days of the Civil War, General McClellan's indecision exasperated Lincoln so much that he wrote a note: "My dear McClellan: If you do not want to use the Army I should like to borrow it. . . ."

Later, Lincoln sent General Hooker to take over the Army; Hooker rushed headlong into action, sending his dispatches from "Headquarters in the saddle." Grinning to an aide, Lincoln said: "The trouble with Hooker is that he's got his headquarters where his hindquarters ought to be."

What 1980 politician can match that?

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